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research division**

**ALKALI-AGGREGATE REACTIVITY
AND DRYING SHRINKAGE TESTS
MORTAR BARS AND CONCRETE PRISMS
SUMMARY OF LONG-TERM MEASUREMENTS**

Report No. 90-210-K

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ABSTRACT

The monitoring of mortar and concrete specimens to evaluate cement-aggregate combinations for alkali-aggregate reactivity and drying shrinkage has been carried out for long periods, up to 23 years in some cases. The data obtained from monitoring the length change of these specimens have been summarized in this report. The test data have not been evaluated or the performance of the aggregates summarized. It is recommended that the monitoring of specimens showing no further tendency for length change be discontinued. Recommendations have also been made regarding additional studies using the specimens no longer being monitored and the evaluation of the test results.

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ontario hydro research division

To: Dr. D. Mills
Director of Research

ALKALI-AGGREGATE REACTIVITY AND DRYING SHRINKAGE TESTS MORTAR BARS AND CONCRETE PRISMS SUMMARY OF LONG-TERM MEASUREMENTS

1.0 INTRODUCTION

The routine testing of cement-aggregate combinations for alkali-aggregate reactivity (ASTM C 227, CSA CAN3-A23.2-14A*) and drying shrinkage (ASTM C 157) consists of fabricating mortar bars and concrete prisms and monitoring the length change at various intervals, generally up to a maximum of one year. The monitoring of some specimens has been extended to longer periods, reaching 23 years in some cases. These specimens represent a number of programs, including the evaluation of aggregates for projects, evaluation of test procedures and cement replacement studies.

To determine the need to continue the monitoring of these bars and prisms, the data collected up to January 31, 1990, have been summarized in this report. Only the specimens exceeding one year in age have been included. Based on the test data and consultation with personnel from the Concrete Technology Section, recommendations have been made whether or not to continue the monitoring of the specimens.

2.0 TEST PROCEDURES

2.1 Alkali-Aggregate Reactivity: Mortar Bar Expansion Test (ASTM C 227)

Test procedure ASTM C 227 "Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)" is used to identify potentially alkali-silica reactive cement-aggregate combinations. It can also be used to evaluate the effectiveness of the partial replacement of cement with supplementary cementing materials to reduce deleterious expansions in concrete.

To carry out the test, mortar bars (25 x 25 x 285 mm) are cast in the laboratory and stored at 95% to 100% relative humidity (rh) and 38°C. Length measurements are made periodically, and the change in length with time is used to evaluate the expansive tendencies of the cement-aggregate combinations.

* The revised version of this test procedure has been recently issued under the designation CAN/CSA - A23.2-14A-M90

The maximum allowable expansion suggested by CSA CAN3-A23.1 (Supplement No. 2-1986), for concrete exposed to freeze/thaw cycles, is as follows:

- (a) For general concrete construction, the expansion is limited to:
 - 0.05% at 3 months
 - 0.10% at 6 months
- (b) For concrete in critical structures, such as nuclear containment, the expansion is limited to:
 - 0.05% at 6 months
 - 0.10% at 1 year

A list of the specimens currently being monitored is given in Table 1, and a summary of the readings obtained to date is given in Appendix A.

Two types of storage containers have been used to carry out the test: circular plexy-glass containers and 5-gallon plastic buckets. Some of these containers were fitted with wicks made of towels. The type of container and the presence of wicks are indicated in the summary of the readings.

2.2 Alkali-Aggregate Reactivity: Concrete Prism Expansion Test (CSA CAN3-A23.2-14A)

The evaluation of cement-aggregate combinations for alkali-carbonate reactions or slow-expanding alkali-silicate/silica reactions is carried out using test procedure CSA CAN3-A23.2-14A "Potential Expansivity of Cement-Aggregate Combinations (Concrete Prism Expansion Method)".

The specimens for this test consist of concrete prisms (89 x 100 x 400 mm or 75 x 100 x 400 mm). The specimens are stored at 100% relative humidity and at 23°C or at 38°C for the accelerated test. Length measurements are made periodically, and the change in length with time is used to evaluate the potential for expansive reactions. The maximum allowable expansion suggested by CSA CAN3-A23.1 (Supplement No. 2-1986), for concrete exposed to freeze/thaw cycles, is as follows:

- (a) For general concrete construction, the expansion is limited to:
 - 0.01% at 3 months for specimens stored at 23°C
 - 0.025% at 1 year for specimens stored at 23°C
 - 0.04% at 1 year for specimens stored at 38°C
- (b) For concrete in critical structures, such as nuclear containment, the expansion is limited to:
 - 0.02% at 1 year for specimens stored at 23°C

The specimens presently being tested are listed in Tables 2 and 3, and the data obtained to date are summarized in Appendices B and C.

2.3 Drying Shrinkage of Concrete Prism Test (ASTM C 157)

The drying shrinkage of concrete is determined using test procedure ASTM C 157 "Length Change of Hardened Hydraulic-Cement Mortar and Concrete".

The specimens cast for this test are similar to those used for CSA CAN3-A23.2-14A. Each specimen is stored at $50 \pm 4\%$ relative humidity and 23°C . Length measurements, taken periodically, are used to monitor the length change with time. The maximum allowable shrinkage, according to Ontario Hydro specifications for major projects, is 0.05%.

Table 4 lists the specimens being tested and Appendix D contains a summary of the readings obtained to date.

3.0 DISCUSSION

Aggregates from various Ontario sources have been tested for long-term alkali-aggregate reactivity using standard test procedures. In most cases, only the test results obtained after one or two years were reported to satisfy the needs of the individual projects. The subsequent readings reported here have therefore not been previously reported or evaluated. The evaluation of these data would identify aggregates and their sources suspected of being alkali-aggregate reactive. This information would be useful in the evaluation of aggregate performance in existing concrete structures and as sources for future construction.

4.0 RECOMMENDATIONS

1. Most of the specimens being monitored for long-term length change appear to have achieved their maximum expansion or shrinkage and have remained unchanged for the last few years. It is therefore recommended that monitoring of these specimens be discontinued. The specimens listed below show a tendency for further length change and the monitoring of these should therefore continue.

ASTM C 227
(Table 1)

Mix No. 12542	Mix No. 13880
Mix No. 12543	Mix No. 13953
Mix No. 13274	Mix No. 13968
Mix No. 13275	Mix No. 13969
Mix No. 13828	

CSA CAN3-A23.2-14A
(Tables 2 and 3)

Stored at 23°C

Mix No. 12245	Mix No. 13498
Mix No. 12246	Mix No. 13577
Mix No. 12608	Mix No. 13578
Mix No. 12896	Mix No. 13681
Mix No. 12897	Mix No. 13682
Mix No. 13050	Mix No. 13683
Mix No. 13497	Mix No. 13684

Stored at 38°C

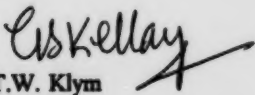
Mix No. 12899	Mix No. 13655
Mix No. 12900	Mix No. 13656
Mix No. 13050	Mix No. 13657

ASTM C 157
(Table 4)

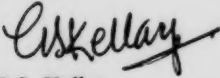
Mix No. 8039	Mix No. 13455
Mix No. 13453	Mix No. 13499

2. Although the monitoring of a majority of the specimens listed in this report is recommended to be discontinued, the specimens should not be discarded. These specimens represent a wealth of information regarding the performance of concrete and concrete materials at various ages in a controlled environment. In some cases, the specimens can be used for further study, a few possible programs are listed below:
- (a) Study the change in physical properties (modulus of rupture, compressive strength, presence and extent of micro-cracking) of concrete containing similar materials, but exhibiting different expansions.
 - (b) Study the difference in the physical properties of concretes having partial replacement of cement with fly ash or silica fume after a number of years of exposure in a controlled environment.
 - (c) Study and compare the performance of concrete in a controlled environment with that in the actual structure.
 - (d) Compare the results obtained from CSA CAN3-A23.2-14A at 23°C and 38°C over a number of years. This may provide a means of predicting the long-term expansion of the concrete based on the accelerated test at 38°C.
3. The results of the tests reported here should be evaluated to identify the susceptibility of aggregates to alkali-aggregate reactivity.

Approved by:

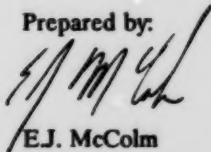
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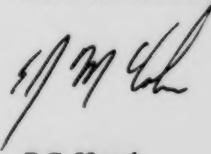
For 
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TABLE 1

DESCRIPTION OF LONG-TERM TEST SPECIMENS
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C227

CONTAINER NO	MIX NO	PROJECT	CEMENT	AGGREGATE	ADDITIVE	DATE CAST
PAIL 1	11141	LOWER NOTCH GS	CL62490 (ALK 0.93%)	S-5913 BELL & HICKEY		JAN 16/67
PAIL 1	11142	LOWER NOTCH GS	CL62490 (ALK 0.93%)	S-5960 EXCAV - GREYWACKE		JAN 16/67
PAIL 1	11228	RED ROCK FALLS GS	CL62490 (ALK 0.93%)	S-5216 LOCATION 16A		FEB 19/68
PAIL 1	11254	LOWER NOTCH GS	CL62490 (ALK 0.93%)	S-5913 BELL & HICKEY	10% FLY ASH	NOV 07/68
PAIL 1	11255	LOWER NOTCH GS	CL62490 (ALK 0.93%)	S-5960 EXCAV - GREYWACKE	10% FLY ASH	NOV 11/68
PAIL 4	11976	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2046 CONSOLIDATED S&G		MAR 05/74
PAIL 4	11977	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2047 WATERFORD SAND		MAR 05/74
138	11978	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2048 R.R. HOSSLER & SONS		MAR 05/74
139	11979	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2049 R.R. HOSSLER & SONS		MAR 07/74
140	11980	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2050 BURNSIDE		MAR 07/74
141	11981	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2051 BURNSIDE		MAR 07/74
142	11982	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2052 EAR FALLS EXCAV		MAR 11/74
143	11983	WESLEYVILLE/PICK	CL67942 (ALK 1.16%)	P-2053 EAR FALLS EXCAV		MAR 11/74
PAIL 2	12218	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6740 YUNDT PIT CR GR		APR 01/75
PAIL 2	12219	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6740 YUNDT PIT CR GR	20% FLY ASH	APR 01/75
PAIL 2	12220	BRUCE GS "B"	CL67942 (ALK 2.0%)	S-6740 YUNDT PIT CR GR		APR 03/75
PAIL 2	12221	BRUCE GS "B"	CL67942 (ALK 2.0%)	S-6740 YUNDT PIT CR GR	20% FLY ASH	APR 03/75
PAIL 3	12302	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6608 WEST PARIS SAND		JUL 28/75
PAIL 3	12303	BRUCE GS "B"	CL67942 (ALK 2.0%)	S-6608 WEST PARIS SAND		JUL 28/75
160	12308	BRUCE GS "B"	CL67942 (ALK 2.0%)	S-6437 EAST PARIS CR GR		AUG 05/75
161	12309	BRUCE GS "B"	CL67942 (ALK 2.0%)	S-6437 EAST PARIS CR GR	20% FLY ASH	AUG 05/75
169	12371	SELECTED AGG	CL67942 (ALK 1.16%)	S-6788 CHERT RICH MAGNETITE		OCT 23/75
170	12415	SELECTED AGG	CL67942 (ALK 1.16%)	S-6790 BEAUHARNOIS ROCK		DEC 11/75
175	12458	SELECTED AGG	CL67942 (ALK 1.16%)	S-6790 BEAUHARNOIS ROCK		MAR 25/76
PAIL 11	12459	SELECTED AGG	CL67942 (ALK 2.0%)	S-6790 BEAUHARNOIS ROCK		MAR 29/76
PAIL 11	12540	SELECTED AGG	CL67942 (ALK 1.16%)	S-5611 HAGERSVILLE CR RK		SEP 28/76
PAIL 11	12541	SELECTED AGG	CL67942 (ALK 1.16%)	S-6136 OXFORD CR GR		SEP 29/76
181	12542	SELECTED AGG	CL67942 (ALK 1.16%)	S-6345 LOWER NOTCH CR RK		SEP 30/76
182	12543	SELECTED AGG	CL67942 (ALK 1.16%)	S-6346 LOWER NOTCH SAND		SEP 30/76
190	12631	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6955 CHAPPELL SAND		JUL 12/77
191	12632	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6956 CHAPPELL CR GR 1 1/2"		JUL 12/77
192	12633	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6957 CHAPPELL CR GR 3/4"		JUL 12/77
193	12634	BRUCE GS "B"	CL67942 (ALK 1.16%)	S-6958 CHAPPELL CR GR 1/2"		JUL 13/77
PAIL 15	13210	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7312;7313;7314 TRT CR GR		APR 01/82
PAIL 15	13211	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7311 TRT SAND		APR 01/82
215	13274	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7376 FLEETWOOD SAND		FEB 10/83
216	13275	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7377 FLEETWOOD CR GR		FEB 10/83
PAIL 13	13313	LAB. STUDY	CL69317 (ALK 1.17%)	C-109 SILICA SAND		MAY 25/83
PAIL 13	13314	LAB. STUDY	CL69317 (ALK 1.17%)	C-109 SILICA SAND	5% FLY ASH	MAY 25/83
PAIL 13	13315	LAB. STUDY	CL69317 (ALK 1.17%)	C-109 SILICA SAND	10% FLY ASH	MAY 25/83
PAIL 13	13316	LAB. STUDY	CL69317 (ALK 1.17%)	C-109 SILICA SAND	25% FLY ASH	MAY 25/83
PAIL 17	13387	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7408 FLEETWOOD SAND		AUG 24/83
PAIL 17	13388	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7409 FLEETWOOD CR GR		AUG 24/83
PAIL 17	13389	BRUCE GS "B"	CL69317 (ALK 1.17%)	S-7410 TARA DERBY CR GR		AUG 24/83

TABLE 1 (Cont'd)

DESCRIPTION OF LONG-TERM TEST SPECIMENS
 POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
 (MORTAR-BAR METHOD)
ASTM C227

CONTAINER NO	MIX NO	PROJECT	CEMENT	AGGREGATE	ADDITIVE	DATE CAST
229/230	13639	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7478 HIGH DENSITY		APR 01/85
PAIL 22	13699	FREDERICK HOUSE	CL69317 (ALK 1.17%)	S-1626 ERAUNHANDS SAND		SEP 26/85
PAIL 22	13700	BRUCE GS "B"	CL69317 (ALK 1.17%)	S-7496 TARA DOWNS CR GR		SEP 26/85
PAIL 25	13784	FREDERICK HOUSE	CL69317 (ALK 1.17%)	S-1622 NELLIS LAKE CR GR		AUG 07/86
PAIL 25	13785	FREDERICK HOUSE	CL69317 (ALK 1.17%)	S-1622 NELLIS LAKE PASS NO 4		AUG 07/86
247/248	13786	LADY EVELYN DAM	CL69317 (ALK 1.17%)	S-6538 LISKEARD CONST CR GR		AUG 07/86
PAIL 25	13787	LOWER NOTCH GS	CL69317 (ALK 1.17%)	S-6345 LOWER NOTCH FDT		AUG 07/86
PAIL 26	13788	HANMER MISSISSAUGI	CL69317 (ALK 1.17%)	S-7526 SAUBLE CONCRETE SAND		FEB 10/87
PAIL 26	13789	NIAGARA REGION	CL69317 (ALK 1.17%)	S-7529 TCG FONTHILL SAND		FEB 10/87
PAIL 27	13790	HANMER TS	CL69317 (ALK 1.17%)	S-7512 SKEAD CR GR		FEB 10/87
PAIL 26	13791	NIAGARA REGION	CL69317 (ALK 1.17%)	S-7530 WALKER IND CR ST		FEB 10/87
249	13828	LOWER NOTCH GS	CL69317 (ALK 1.17%)	S-6345 LOWER NOTCH FDT		FEB 10/87
PAIL 28	13831	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7555 FLEETWOOD SAND		FEB 17/87
PAIL 28	13832	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7556 FLEETWOOD CR GR		FEB 17/87
PAIL 29	13855	OTTAWA-LENNOX TL	CL69317 (ALK 1.17%)	S-7570 GEO TACKABERRY CR ST		SEP 28/87
PAIL 29	13856	OTTAWA-HAWTHORN TS	CL69317 (ALK 1.17%)	S-7571 BURNSIDE SAND		SEP 28/87
PAIL 30	13857	OTTAWA-HAWTHORN TS	CL69317 (ALK 1.17%)	S-7572 BURNSIDE CR ST		SEP 28/87
PAIL 30	13858	EUGENIA FALLS GS	CL69317 (ALK 1.17%)	S-7573 DURHAM SAND		SEP 28/87
250	13880	AAR CONTAINER EVAL	CL69317 (ALK 1.17%)	S-1622 NELLIS LAKE PASS NO 4		DEC 29/87
251	13953	CRYSTAL FALLS GS	CL70180 (ALK 1.00%)	S-7626 SKEAD DEPOSIT		AUG 24/88
252	13968	CONCRETE DURABILITY	CL70180 (ALK 1.00%)	S-7650 ZEALAND PIT NB SAND		NOV 16/88
253	13969	CONCRETE DURABILITY	CL70180 (ALK 1.00%)	S-7651 MACTAQUAC SITE EXCA		NOV 16/88

TABLE 2

DESCRIPTION OF LONG-TERM TEST SPECIMENS
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)
CSA CAN3-A23.2-14A

SPECIMENS STORED AT 23°C

MIX NO	PROJECT	CEMENT	FINE AGG.	COARSE AGG.	ADDITIVE	DATE CAST
11440	LENNOX GS	CL62490 (ALK 0.93%)	S-6292 PARIS SAND	S-6409 CR RK CORE NO4 3/4"		APR 21/70
11441	LENNOX GS	CL62490 (ALK 0.93%)	S-6292 PARIS SAND	S-5526 DUNDAS CR ST		APR 21/70
11513	LENNOX GS	CL62490 (ALK 0.93%)	S-6292 PARIS SAND	S-6451 MCGUINNES & OCONNERS		JAN 21/71
11838	ARNPRIOR GS	CL66858 (ALK 1.02%)	S-6582 DIBBLE SAND	S-6376 DUNDAS CR ST		JUL 18/73
11839	ARNPRIOR GS	CL66858 (ALK 1.02%)	S-6582 DIBBLE SAND	S-6583 BRAESIDE CR RK		JUL 18/73
11840	ARNPRIOR GS	CL66858 (ALK 1.02%)	S-6582 DIBBLE SAND	S-6566 WABA CREEK		JUL 24/73
11841	ARNPRIOR GS	CL66858 (ALK 1.02%)	S-6582 DIBBLE SAND	S-6574 HOFFMAN CR RK		JUL 24/73
12194	PICKERING GS "B"	CL67942 (ALK 1.16%)	S-6608 PARIS SAND	S-6437 PARIS CR GR		JAN 16/75
12195	PICKERING GS "B"	CL67942 (ALK 1.16%)	S-6720 MOSSPORT SAND	S-6721&26 MOSSPORT CR GR		JAN 16/75
12214	INCO SLAG	CL67942 (ALK 1.16%)	S-6473 SPECULARITE	S-6738 INCO SLAG		MAR 4/75
12223	BRUCE GS	CL67942 (ALK 2.0%)	S-6608 PARIS SAND	S-6437 PARIS CR GR		APR 9/75
12224	BRUCE GS	CL67942 (ALK 2.0%)	S-6739A YUNTD PIT	S-6740A YUNTD PIT		APR 9/75
12225	BRUCE GS	CL67942 (ALK 1.16%)	S-6739A YUNTD PIT	S-6740A YUNTD PIT		APR 9/75
12243	INCO SLAG	CL67942 (ALK 1.16%)	S-6608 PARIS SAND	S-6747 INCO SLAG		APR 22/75
12244	INCO SLAG	CL67942 (ALK 2.0%)	S-6608 PARIS SAND	S-6747 INCO SLAG		APR 22/75
12245	INCO SLAG	CL67942 (ALK 1.16%)	S-6473 SPECULARITE	S-6747 INCO SLAG		APR 22/75
12246	INCO SLAG	CL67942 (ALK 2.0%)	S-6473 SPECULARITE	S-6747 INCO SLAG		APR 22/75
12375	HIGH DENSITY AGG	CL68222 (ALK 0.91%)	S-6760 ORTON MINE	S-6760 ORTON MINE		NOV 12/75
12386	WESLEYVILLE GS	CL68222 (ALK 0.91%)	S-6791 BRIGHTON PIT	S-6789 BRIGHTON PIT		NOV 25/75
12444	BEAUHARNOIS	CL68222 (ALK 0.91%)	S-6608 PARIS SAND	S-6790 BEAUHARNOIS		FEB 24/76
12607	HIGH DENSITY AGG	CL68764 (ALK 1.04%)	S-6761 SPECULARITE	S-6928 PANCAKE LAKE CORE		MAR 29/77
12608	CONTROL	CL68764 (ALK 1.04%)	S-6608 PARIS SAND	S-6376 DUNDAS CR ST		MAR 31/77

TABLE 2 (Cont'd)

DESCRIPTION OF LONG-TERM TEST SPECIMENS
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)
CSA CAN3-A23.2-14A

SPECIMENS STORED AT 23°C

MIX NO	PROJECT	CEMENT	FINE AGG.	COARSE AGG.	ADDITIVE	DATE CAST
12609	CONTROL	CL68764 (ALK 1.04%)	S-6608 PARIS SAND	S-6437 PARIS CR GR		APR 5/77
12896	SELECTED AGG	CL69317 (ALK 1.17%)	S-6854 PARIS SAND	S-7115 WESLEYVILLE FDN RK		MAR 7/79
12897	SELECTED AGG	CL69317 (ALK 1.17%)	S-6854 PARIS SAND	S-7116 ST MARY'S QUARRY		MAR 7/79
13037	R H SAUNDERS GS	CL69317 (ALK 1.17%)	S-7167 PARIS SAND	S-6376 DUNDAS CR ST		SEP 24/80
13038	R H SAUNDERS GS	CL69317 (ALK 1.17%)	S-4785 MANUF. SAND	S-4805 LIMESTONE CR RK		SEP 24/80
13039	R H SAUNDERS GS	CL69317 (ALK 1.17%)	S-7167 PARIS SAND	S-6790 BEAUHARNOIS		SEP 24/80
13042	DARLINGTON GS	CL69317 (ALK 1.17%)	S-7214 FLEETWOOD	S-7215 FLEETWOOD PIT		OCT 1/80
13050	ATIKOKAN GS	CL69317 (ALK 1.17%)	S-7221 ATIKOKAN FDN	S-7219&7220 ATIKOKAN FDN		NOV 25/80
13497	RAT RAPIDS DAM	CL69317 (ALK 1.17%)	S-7452 MTC PIT	S-7452 MTC PIT		JUN 7/84
13498	RAT RAPIDS DAM	CL70055 (ALK 0.78%)	S-7452 MTC PIT	S-7452 MTC PIT		JUN 7/84
13577	RAT RAPIDS DAM	CL70094 PROJECT	S-7465 MTC PIT	S-7466 MTC PIT		NOV 22/84
13578	RAT RAPIDS DAM	CL69317 (ALK 1.17%)	S-7465 MTC PIT	S-7466 MTC PIT		NOV 22/84
13681	RAD. WASTE DISPOSAL	CL70146 (ALK 0.72%)	S-7167 PARIS SAND	S-6376 DUNDAS CR ST		SEP 10/85
13682	RAD. WASTE DISPOSAL	CL70146 (ALK 0.72%)	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	10% SILICA FUME	SEP 18/85
13683	RAD. WASTE DISPOSAL	CL70146 (ALK 0.72%)	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	15% SILICA FUME	OCT 3/85
13684	RAD. WASTE DISPOSAL	CL70146 (ALK 0.72%)	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	20% SILICA FUME	OCT 10/85

TABLE 3

DESCRIPTION OF LONG-TERM TEST SPECIMENS
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)
CSA CAN3-A23.2-14A

SPECIMENS STORED AT 38°C

MIX NO	PROJECT	CEMENT	FINE AGG.	COARSE AGG.	DATE CAST
12607	HIGH DENSITY AGG	CL68764	S-6761	S-6928	MAR 29/77
		(ALK 1.04%)	SPECULARITE	PANCAKE LAKE	
12609	CONTROL	CL68764	S-6608	S-6437	APR 5/77
		(ALK 1.04%)	PARIS SAND	PARIS CR GR	
12673	BRUCE GS "B"	CL68764	S-6987	S-6986	SEPT 8/77
		(ALK 1.04%)	CHAPPELL PIT	McVITTIE PIT	
12687	BRUCE GS "B"	CL68764	S-6955	S-7002	OCT 20/77
		(ALK 1.04%)	CHAPPELL PIT	McVITTIE PIT	
12688	BRUCE GS "B"	CL68764	S-6955	S-7003	OCT 20/77
		(ALK 1.04%)	CHAPPELL PIT	TARA	
12857	ATIKOKAN GS	CL68764	S-6854	S-7040	OCT 19/78
		(ALK 1.04%)	PARIS SAND	CR ROCK CORE	
12861	ATIKOKAN GS	CL68764	S-6854	S-7109	NOV 21/78
		(ALK 1.04%)	PARIS SAND	EXCAVATED ROCK	
12899	WESLEYVILLE GS	CL69317	S-6854	S-7115	MAR 15/79
		(ALK 1.17%)	PARIS SAND	FOUNDATION RK	
12900	DARLINGTON GS	CL69317	S-6854	S-7116	MAR 15/79
		(ALK 1.17%)	PARIS SAND	ST. MARY'S CR ST	
13037	R H SAUNDERS GS	CL69317	S-7167	S-6376	SEPT 24/80
		(ALK 1.17%)	PARIS SAND	DUNDAS CR ST	
13038	R H SAUNDERS GS	CL69317	S-4785	S-4805	SEPT 24/80
		(ALK 1.17%)	MANUF. SAND	LIMESTONE CR RK	
13039	R H SAUNDERS GS	CL69317	S-7167	S-6790	SEPT 24/80
		(ALK 1.17%)	PARIS SAND	BEAUHARNOIS	
13042	DARLINGTON GS	CL69317	S-7214	S-7215	OCT 1/80
		(ALK 1.17%)	FLEETWOOD	FLEETWOOD	
13050	ATIKOKAN GS	CL69317	S-7221	S-7219&7220	NOV 25/80
		(ALK 1.17%)	ATIKOKAN	ATIKOKAN CR ST	
13577	RAT RAPIDS DAM	CL70094	S-7465	S-7466	NOV 22/84
		PROJECT	PROJECT	EXCAVATED ROCK	
13578	RAT RAPIDS DAM	CL69317	S-7465	S-7466	NOV 22/84
		(ALK 1.17%)	PROJECT	EXCAVATED ROCK	
13655	MACTAQUAC GS	CL69317	S-7167	S-7487	JULY 3/85
		(ALK 1.17%)	PARIS SAND	N. B. CR ROCK	
13656	MACTAQUAC GS	CL69317	S-7492	S-7487	JULY 3/85
		(ALK 1.17%)	N.B. SAND	N. B. CR ROCK	
13657	MACTAQUAC GS	CL70138	S-7492	S-7487	JULY 3/85
		PROJECT	N.B. SAND	N. B. CR ROCK	

TABLE 4

DESCRIPTION OF LONG-TERM TEST SPECIMENS
LENGTH AND WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE
ASTM C 157

MIX NO	PROJECT	CEMENT	FINE AGG.	COARSE AGG.	ADDITIVE	DATE CAST
8039	HIGH DENSITY CONC	ST. MARY'S *	6541 *	6542 *	*	JUL 19/88
13425	DARLINGTON GS	(CL70281) CL70017	SPECULARITE S-7436	MAGNETITE S-7437	CONTROL	NOV 29/83
13426	DARLINGTON GS	CL70017	FLEETWOOD SAND S-7436	FLEETWOOD CR GR S-7437	MIGHTY 150	NOV 30/83
13427	DARLINGTON GS	CL70017	FLEETWOOD SAND S-7436	FLEETWOOD CR GR S-7437	DX 100	NOV 30/83
13428	DARLINGTON GS	CL70017	FLEETWOOD SAND S-7436	FLEETWOOD CR GR S-7437	SIKAMENT	NOV 30/83
13429	DARLINGTON GS	CL70017	FLEETWOOD SAND S-7436	FLEETWOOD CR GR S-7437	PLASTIMENT MELMENT	DEC 01/83
13453	HIGH DENSITY CONC	CL70037	FLEETWOOD SAND S-7449	FLEETWOOD CR GR S-7450	20% SILICA FUME CL69888	FEB 29/84
13454	HIGH DENSITY CONC	CL69944	SPECULARITE S-7449	MAGNETITE S-7450		MAR 07/84
13455	HIGH DENSITY CONC	CL70037	SPECULARITE S-7449	MAGNETITE S-7450	10% SILICA FUME CL69888	MAR 13/84
13499	HIGH DENSITY CONC	**	SPECULARITE **	MAGNETITE **	**	JUN 07/84
13522	HIGH DENSITY CONC	CL70017	S-7456 SPECULARITE	S-7450 HEMATITE	5% FLY ASH CL68358	JUL 25/84
13681	RAD WASTE DISPOSAL	CL70146	S-7167 PARIS SAND	S-6376 DUNDAS CR ST		SEP 10/85
13682	RAD WASTE DISPOSAL	CL70146	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	10% SILICA FUME CL70109	SEP 18/85
13683	RAD WASTE DISPOSAL	CL70146	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	15% SILICA FUME CL70109	OCT 03/85
13684	RAD WASTE DISPOSAL	CL70146	S-7167 PARIS SAND	S-6376 DUNDAS CR ST	20% SILICA FUME CL70109	OCT 10/85
13685	RAD WASTE DISPOSAL	CL70146	S-7167 PARIS SAND	S-6376 DUNDAS CR ST		OCT 23/85

* High density concrete used for Dry Storage Modules. Specimens cast at Darlington GS.

** High density cask mix. Specimens cast at Darlington GS.

APPENDIX A

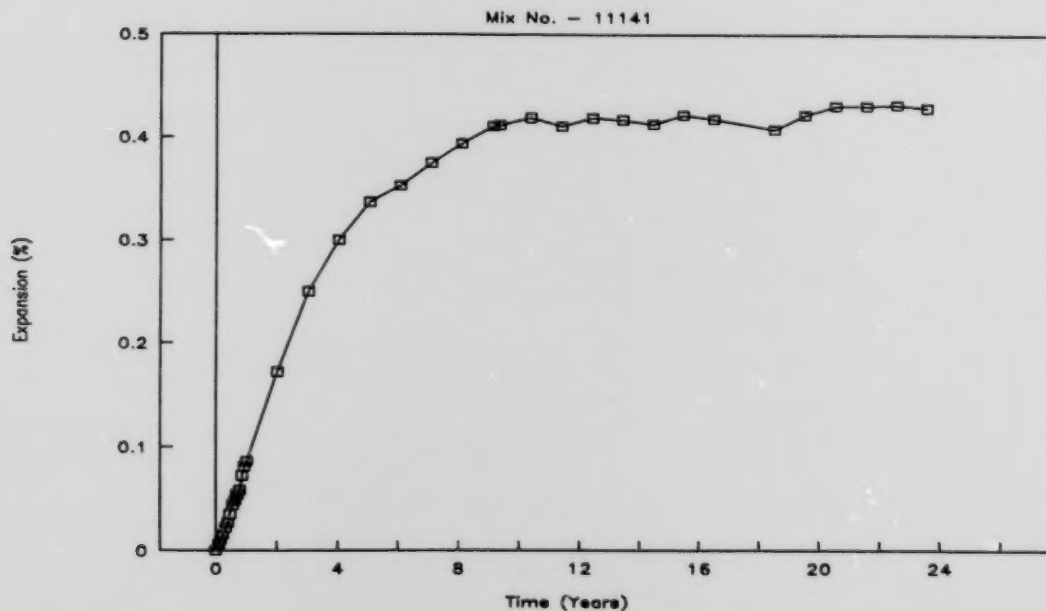
**POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227
LONG-TERM TEST DATA**

POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11141
No. of Specimens : 4
Project : LOWER NOTCH GS
Date Cast : 16-Jan-67
Age (as of Jan 1/90) : 23 years
Remarks : Specimens stored in Pail 1
Not all data were reported
Several hairline cracks on several locations (08-Apr-69)
White and dark deposits on all sides (23-Jul-75)
Cracks increasing in size (16-Oct-75)
Small portion of surface starting to blister (01-Apr-77)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Jan-67	0	0.000	13-Jan-70	36	0.250	03-Apr-80	161	0.417
14-Feb-67	1	0.006	02-Jun-70	41	0.271	07-Apr-81	173	0.413
14-Mar-67	2	0.010	12-Jan-71	49	0.300	02-Apr-82	185	0.422
11-Apr-67	3	0.015	01-Jun-71	53	0.315	06-Apr-83	197	0.418
09-May-67	4	0.022	11-Jan-72	61	0.337	03-Apr-85	222	0.408
06-Jun-67	5	0.027	27-Jun-72	66	0.351	03-Apr-86	234	0.422
04-Jul-67	6	0.035	09-Jan-73	73	0.353	07-Apr-87	246	0.431
01-Aug-67	7	0.044	26-Jun-73	78	0.370	06-Apr-88	258	0.431
29-Aug-67	7	0.048	08-Jan-74	85	0.375	04-Apr-89	270	0.432
26-Sep-67	8	0.054	25-Jun-74	91	0.384	03-Apr-90	283	0.429
24-Oct-67	9	0.058	07-Jan-75	97	0.394			
21-Nov-67	10	0.072	26-Jun-75	103	0.408			
19-Dec-67	11	0.081	16-Jan-76	110	0.411			
16-Jan-68	12	0.086	01-Apr-76	112	0.412			
04-Jun-68	17	0.120	01-Apr-77	124	0.419			
14-Jan-69	24	0.172	04-Apr-78	137	0.411			
03-Jun-69	29	0.199	05-Apr-79	149	0.419			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 11142

Aggregate: S-5960 EXCAV - GREYWACKE

No. of Specimens : 4

Cement: CL62490 LAB. STD. (ALK 0.93%)

Project : LOWER NOTCH GS

Date Cast : 16-Jan-67

Age (as of Jan 1/90) : 23 years

Remarks : Specimens stored in Pail 1

Not all data were reported

Several hairline cracks on several locations (12-Dec-69)

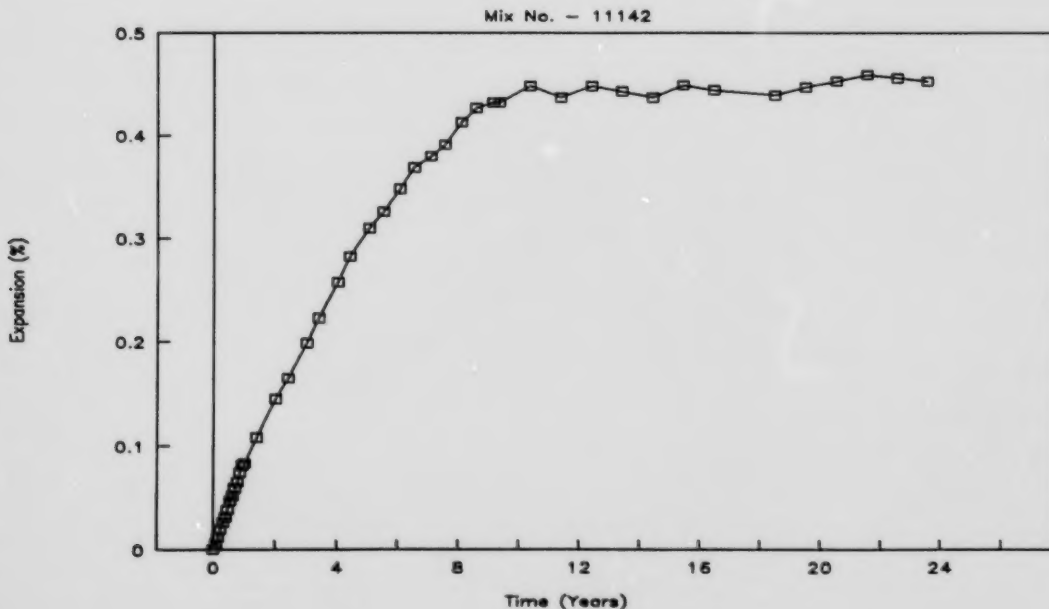
White and dark deposits on all sides (23-Jul-75)

Small portion of surface starting to blister (01-Apr-77)

Hairline cracks at ends of all bars (04-Apr-78)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Jan-67	0	0.000	13-Jan-70	36	0.199	03-Apr-80	161	0.443
14-Feb-67	1	0.006	02-Jun-70	41	0.223	07-Apr-81	173	0.437
14-Mar-67	2	0.012	12-Jan-71	49	0.258	02-Apr-82	185	0.449
11-Apr-67	3	0.019	01-Jun-71	53	0.283	06-Apr-83	197	0.444
09-May-67	4	0.026	11-Jan-72	61	0.310	03-Apr-85	222	0.439
06-Jun-67	5	0.031	27-Jun-72	66	0.326	03-Apr-86	234	0.447
04-Jul-67	6	0.038	09-Jan-73	73	0.348	07-Apr-87	246	0.453
01-Aug-67	7	0.047	26-Jun-73	78	0.369	06-Apr-88	258	0.459
29-Aug-67	7	0.052	08-Jan-74	85	0.380	04-Apr-89	270	0.456
26-Sep-67	8	0.059	25-Jun-74	91	0.391	03-Apr-90	283	0.453
24-Oct-67	9	0.065	07-Jan-75	97	0.413			
21-Nov-67	10	0.074	26-Jun-75	103	0.427			
19-Dec-67	11	0.081	16-Jan-76	110	0.432			
16-Jan-68	12	0.083	01-Apr-76	112	0.432			
04-Jun-68	17	0.108	01-Apr-77	124	0.448			
14-Jan-69	24	0.145	04-Apr-78	137	0.437			
03-Jun-69	29	0.165	05-Apr-79	149	0.448			



ASTM C 227

Aggregate: S-5216 LOCATION 16A
Cement: CL62490 LAB. STD. (ALK 0.93%)

Hairline cracks on ends of all bars (01-Apr-78)

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
20-Feb-68	0	0.000	07-Jul-70	29	0.125	03-Apr-80	148	0.369
19-Mar-68	1	0.009	16-Feb-71	36	0.167	07-Apr-81	160	0.369
17-Apr-68	2	0.012	06-Jul-71	41	0.193	02-Apr-82	172	0.375
14-May-68	3	0.011	15-Feb-72	49	0.229	06-Apr-83	184	0.379
11-Jun-68	4	0.014	05-Jul-72	53	0.241	03-Apr-85	208	0.360
09-Jul-68	5	0.017	13-Feb-73	61	0.265	03-Apr-86	221	0.374
06-Aug-68	6	0.021	31-Jul-73	66	0.284	07-Apr-87	233	0.376
04-Sep-68	7	0.024	12-Feb-74	73	0.296	06-Apr-88	245	0.381
01-Oct-68	7	0.028	30-Jul-74	78	0.312	04-Apr-89	257	0.380
29-Oct-68	8	0.033	12-Feb-75	85	0.336	03-Apr-90	269	0.377
26-Nov-68	9	0.036	29-Jul-75	91	0.347			
24-Dec-68	10	0.040	19-Feb-76	97	0.363			
21-Jan-69	11	0.043	01-Apr-76	99	0.362			
18-Feb-69	12	0.048	01-Apr-77	111	0.376			
08-Jul-69	17	0.069	04-Apr-78	123	0.365			
17-Feb-70	24	0.103	04-Apr-79	135	0.374			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 11254
No. of Specimens : 4
Project : LOWER NOTCH GS
Date Cast : 07-Nov-68
Age (as of Jan 1/90) : 21 years
Remarks : Specimens stored in Pail 1
Not all data were reported
Spotty white deposit on all faces (25-Feb-72)
Hairline cracks on all bars (01-Dec-72)
Blisters starting to form on surfaces of bars (01-Apr-77)
Black deposit on all surfaces (01-Apr-77)

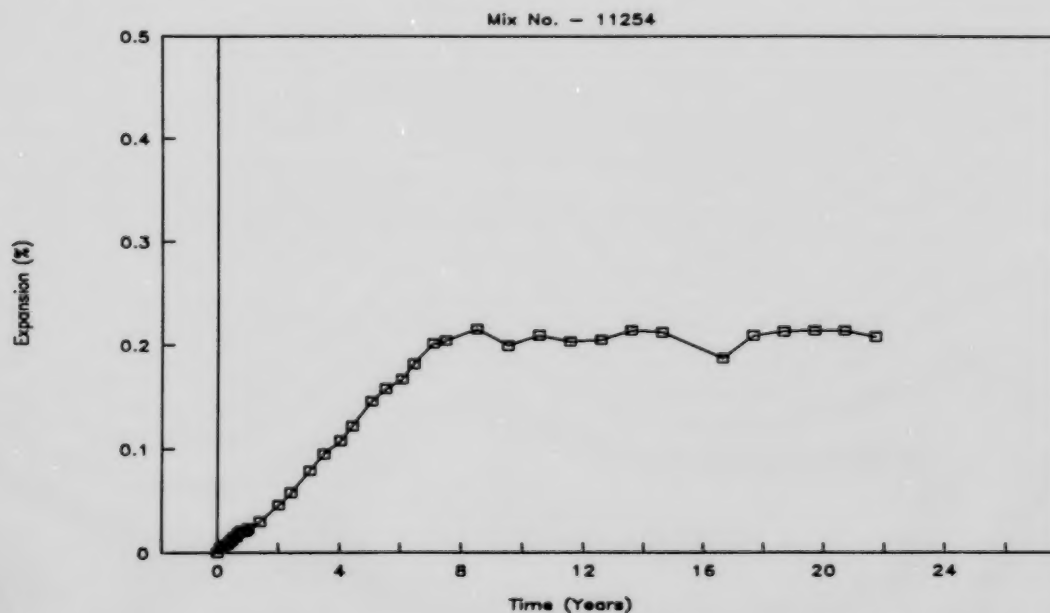
Aggregate: S-5913 BELL & HICKEY

Cement: CL62490 LAB. STD. (ALK 0.93%)

Fly Ash: 10% CL65301

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Nov-68	0	0.000	05-Nov-71	36	0.079	03-Apr-85	200	0.188
06-Dec-68	1	0.004	21-Apr-72	42	0.095	03-Apr-86	212	0.210
03-Jan-69	2	0.005	03-Nov-72	49	0.108	07-Apr-87	224	0.214
31-Jan-69	3	0.007	23-Mar-73	53	0.122	06-Apr-88	236	0.215
28-Feb-69	4	0.008	02-Nov-73	61	0.146	04-Apr-89	248	0.215
28-Mar-69	5	0.010	19-Apr-74	66	0.158	03-Apr-90	261	0.209
25-Apr-69	6	0.012	01-Nov-74	73	0.167			
23-May-69	7	0.015	21-Mar-75	77	0.182			
20-Jun-69	7	0.015	07-Nov-75	85	0.202			
18-Jul-69	8	0.019	01-Apr-76	90	0.205			
15-Aug-69	9	0.021	01-Apr-77	102	0.216			
12-Sep-69	10	0.020	04-Apr-78	114	0.200			
10-Oct-69	11	0.021	04-Apr-79	127	0.210			
07-Nov-69	12	0.023	03-Apr-80	139	0.204			
26-Mar-70	17	0.030	07-Apr-81	151	0.206			
06-Nov-70	24	0.046	02-Apr-82	163	0.215			
26-Mar-71	29	0.058	06-Apr-83	175	0.213			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

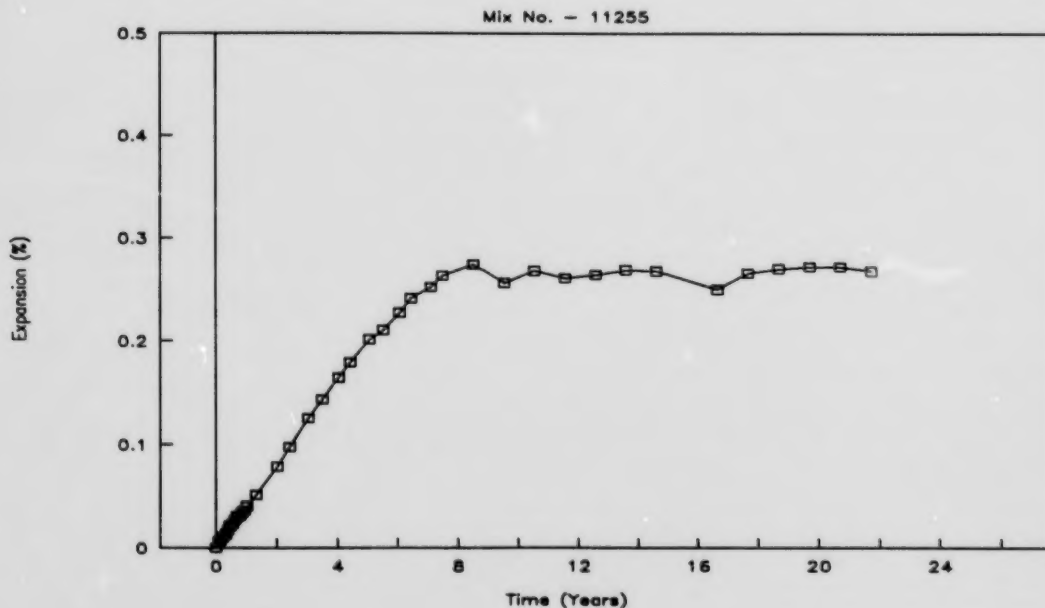
ASTM C 227

Mix No. : 11255
No. of Specimens : 4
Project : LOWER NOTCH GS
Date Cast : 11-Nov-68
Age (as of Jan 1/90) : 21 years
Remarks : Specimens stored in Pail 1
Not all data were reported
White and black deposits on all bars (01-Apr-76)
Blisters starting to form on surfaces of bars (01-Apr-77)

Aggregate: S-5960 EXCAV - GREYWACKE
Cement: CL62490 LAB. STD. (ALK 0.93%)
Fly Ash: 10% CL65301

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
12-Nov-68	0	0.000	07-Nov-72	49	0.164	04-Apr-89	248	0.272
10-Dec-68	1	0.006	27-Mar-73	53	0.179	03-Apr-90	260	0.268
07-Jan-69	2	0.007	06-Nov-73	61	0.201			
04-Feb-69	3	0.010	23-Apr-74	66	0.210			
04-Mar-69	4	0.013	05-Nov-74	73	0.227			
01-Apr-69	5	0.017	25-Mar-75	77	0.241			
29-Apr-69	6	0.021	12-Nov-75	85	0.252			
27-May-69	7	0.023	01-Apr-76	90	0.263			
24-Jun-69	7	0.027	01-Apr-77	102	0.274			
22-Jul-69	8	0.030	04-Apr-78	114	0.256			
19-Aug-69	9	0.031	05-Apr-79	127	0.268			
16-Sep-69	10	0.034	03-Apr-80	139	0.261			
15-Oct-69	11	0.036	07-Apr-81	151	0.264			
11-Nov-69	12	0.040	02-Apr-82	163	0.269			
03-Mar-70	16	0.051	06-Apr-83	175	0.268			
10-Nov-70	24	0.078	03-Apr-85	200	0.250			
30-Mar-71	29	0.097	03-Apr-86	212	0.266			
09-Nov-71	36	0.125	07-Apr-87	224	0.270			
25-Apr-72	42	0.143	06-Apr-88	236	0.272			

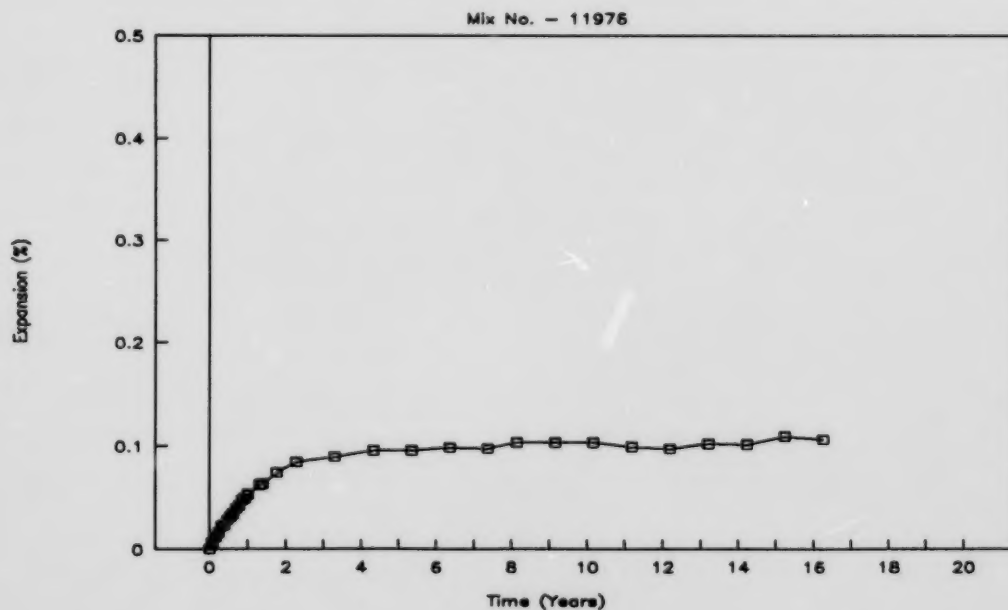


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11976 Aggregate: P-2046 CONSOLIDATED S&G
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : WESLEYVILLE/PICK
Date Cast : 05-Mar-74
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored in Pail 4
Not all data were reported
White deposit on all bars (23-Jul-75)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Mar-74	0	0.000	14-Jun-79	64	0.095
03-Apr-74	1	0.006	13-Jun-80	76	0.098
01-May-74	2	0.012	11-Jun-81	88	0.097
29-May-74	3	0.016	16-Mar-82	98	0.103
26-Jun-74	4	0.022	17-Mar-83	110	0.103
24-Jul-74	5	0.023	15-Mar-84	122	0.103
21-Aug-74	6	0.028	15-Mar-85	134	0.099
18-Sep-74	7	0.031	14-Mar-86	146	0.097
16-Oct-74	7	0.034	13-Mar-87	159	0.102
13-Nov-74	8	0.039	15-Mar-88	171	0.101
11-Dec-74	9	0.042	15-Mar-89	183	0.109
08-Jan-75	10	0.047	15-Mar-90	195	0.106
05-Feb-75	11	0.049			
05-Mar-75	12	0.053			
25-Jun-75	16	0.062			
23-Jul-75	17	0.063			
05-Dec-75	21	0.074			
07-Jun-76	27	0.084			
07-Jun-77	40	0.089			
16-Jun-78	52	0.095			



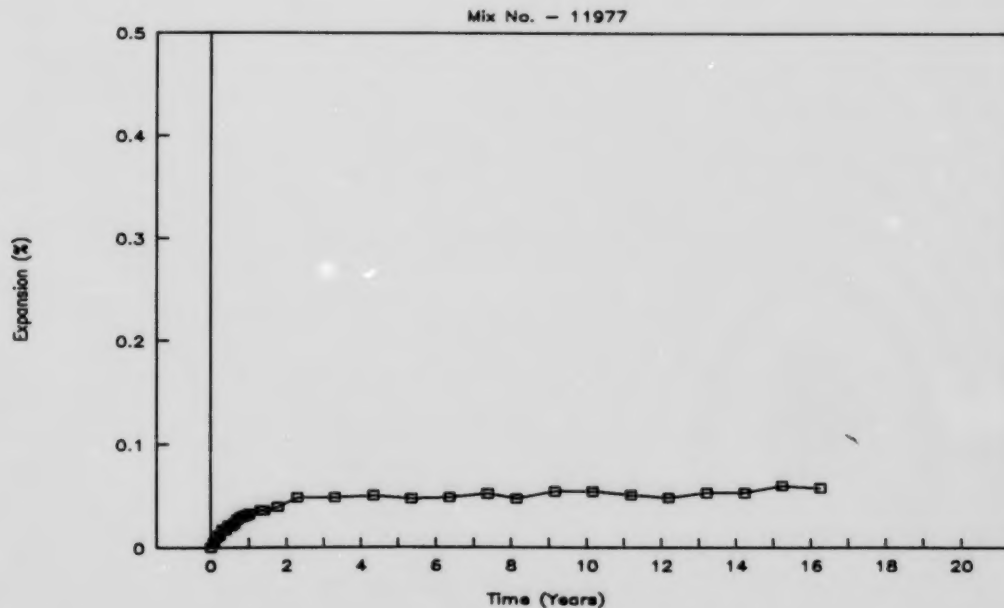
POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 11977 Aggregate: P-2047 WATERFORD SAND
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : WESLEYVILLE/PICK
Date Cast : 05-Mar-74
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored in Pail 4
Not all data were reported
White deposit on all bars (23-Jul-75)
Dark deposit on all bars (08-Jun-76)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Mar-74	0	0.000	16-Jun-78	52	0.050
03-Apr-74	1	0.004	14-Jun-79	64	0.047
01-May-74	2	0.010	13-Jun-80	76	0.048
29-May-74	3	0.012	11-Jun-81	88	0.052
26-Jun-74	4	0.017	16-Mar-82	98	0.047
24-Jul-74	5	0.017	17-Mar-83	110	0.054
21-Aug-74	6	0.021	15-Mar-84	122	0.054
18-Sep-74	7	0.021	15-Mar-85	134	0.051
16-Oct-74	7	0.023	14-Mar-86	146	0.048
13-Nov-74	8	0.027	14-Mar-87	159	0.053
11-Dec-74	9	0.029	15-Mar-88	171	0.053
08-Jan-75	10	0.030	15-Mar-89	183	0.060
05-Feb-75	11	0.031	15-Mar-90	195	0.058
05-Mar-75	12	0.032			
25-Jun-75	16	0.036			
23-Jul-75	17	0.036			
05-Dec-75	21	0.039			
08-Jun-76	28	0.048			
07-Jun-77	40	0.048			

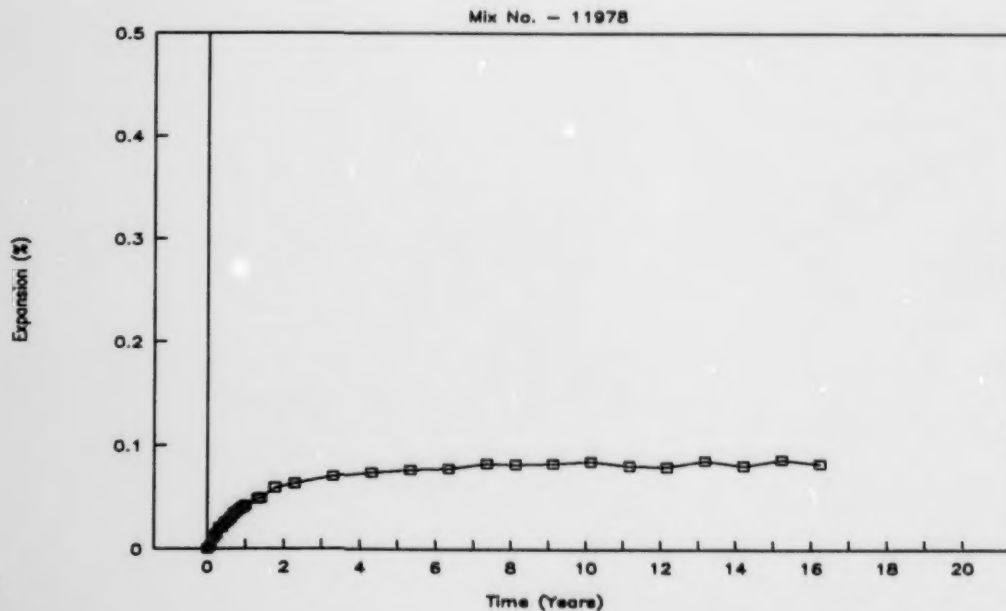


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11978 Aggregate: P-2048 R.R. HOSSLER & SONS
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : WESLEYVILLE/PICK
Date Cast : 05-Mar-74
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored in Container 138
Not all data were reported
White deposit on all bars (23-Jul-75)
Dark deposit on all bars (08-Jun-76)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Mar-74	0	0.000	07-Jun-78	52	0.074
03-Apr-74	1	0.003	06-Jun-79	64	0.077
01-May-74	2	0.011	06-Jun-80	76	0.078
29-May-74	3	0.014	05-Jun-81	88	0.083
26-Jun-74	4	0.020	09-Mar-82	98	0.082
24-Jul-74	5	0.021	03-Mar-83	109	0.083
21-Aug-74	6	0.025	02-Mar-84	122	0.085
18-Sep-74	7	0.027	08-Mar-85	134	0.081
16-Oct-74	7	0.030	05-Mar-86	146	0.080
13-Nov-74	8	0.034	05-Mar-87	158	0.086
11-Dec-74	9	0.036	08-Mar-88	171	0.081
08-Jan-75	10	0.038	10-Mar-89	183	0.087
05-Feb-75	11	0.040	09-Mar-90	195	0.083
05-Mar-75	12	0.042			
25-Jun-75	16	0.048			
23-Jul-75	17	0.049			
05-Dec-75	21	0.059			
08-Jun-76	28	0.063			
07-Jun-77	40	0.070			



ASTM C 227

TEST DATA

Mix No. - 11979



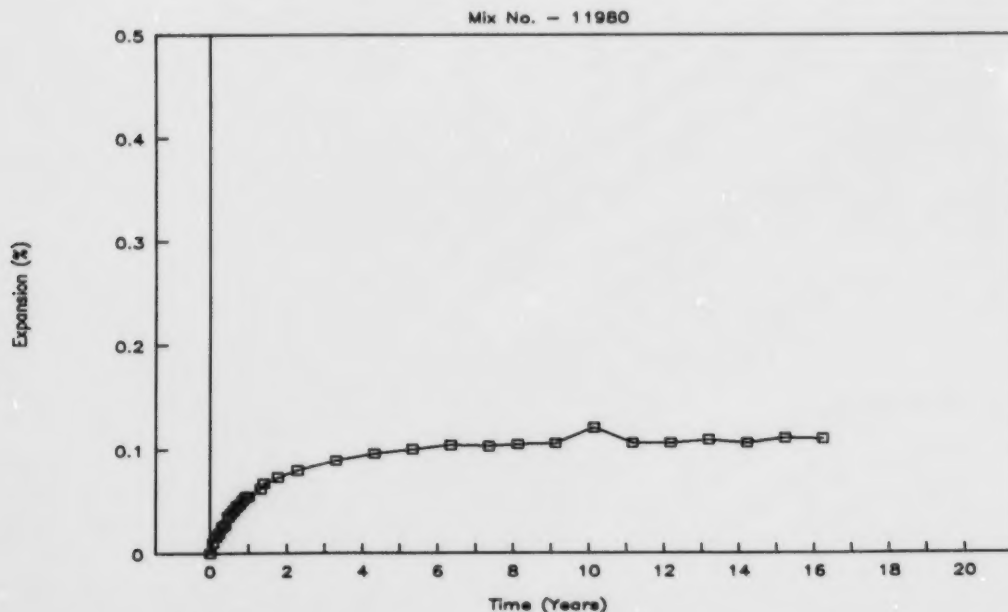
POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 11980 Aggregate: P-2050 BURNSIDE
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : WESLEYVILLE/PICK
Date Cast : 07-Mar-74
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored in Container 140
Not all data were reported
White deposit on all bars (25-Jul-75)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Mar-74	0	0.000	06-Jun-79	64	0.100
05-Apr-74	1	0.010	06-Jun-80	76	0.104
03-May-74	2	0.016	05-Jun-81	88	0.103
31-May-74	3	0.019	09-Mar-82	97	0.105
28-Jun-74	4	0.025	03-Mar-83	109	0.106
26-Jul-74	5	0.027	02-Mar-84	122	0.121
26-Aug-74	6	0.035	28-Mar-85	134	0.106
20-Sep-74	7	0.038	05-Mar-86	146	0.106
18-Oct-74	7	0.041	05-Mar-87	158	0.109
15-Nov-74	8	0.045	08-Mar-88	170	0.106
13-Dec-74	9	0.047	10-Mar-89	183	0.111
10-Jan-75	10	0.051	09-Mar-90	195	0.110
07-Feb-75	11	0.054			
07-Mar-75	12	0.055			
27-Jun-75	16	0.062			
25-Jul-75	17	0.067			
05-Dec-75	21	0.073			
08-Jun-76	27	0.080			
07-Jun-77	40	0.089			
07-Jun-78	52	0.096			

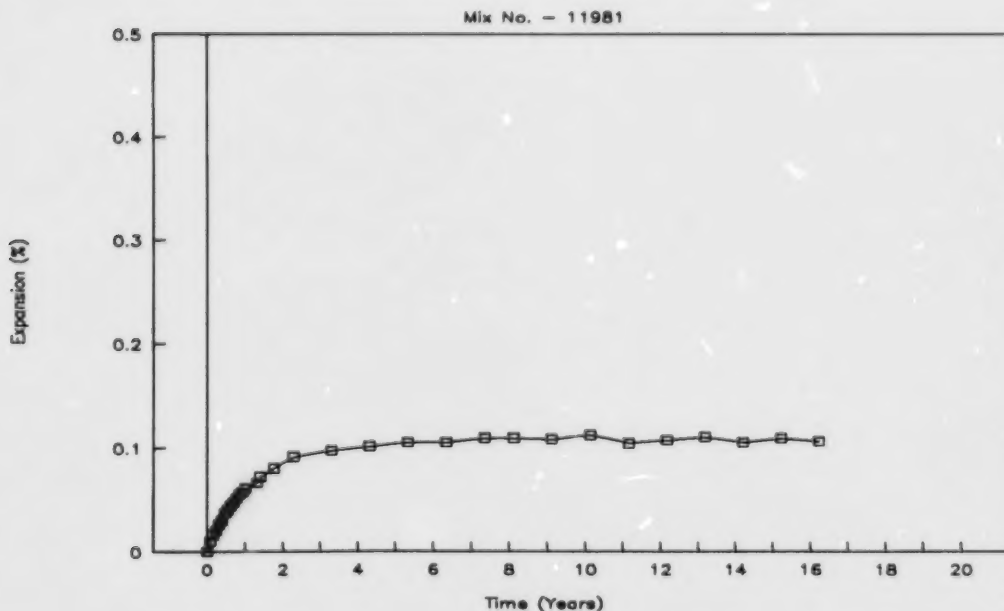


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11981 Aggregate: P-2051 BURNSIDE
 No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
 Project : WESLEYVILLE/PICK
 Date Cast : 07-Mar-74
 Age (as of Jan 1/90) : 16 years
 Remarks : Specimens stored in Container 141
 Not all data were reported
 White deposit on all bars (25-Jul-75)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Mar-74	0	0.000	06-Jun-79	64	0.105
05-Apr-74	1	0.010	06-Jun-80	76	0.105
03-May-74	2	0.016	05-Jun-81	88	0.109
31-May-74	3	0.020	09-Mar-82	97	0.109
28-Jun-74	4	0.026	03-Mar-83	109	0.108
26-Jul-74	5	0.030	02-Mar-84	122	0.112
26-Aug-74	6	0.037	08-Mar-85	134	0.104
20-Sep-74	7	0.040	05-Mar-86	146	0.107
18-Oct-74	7	0.044	06-Mar-87	158	0.110
15-Nov-74	8	0.047	08-Mar-88	170	0.105
13-Dec-74	9	0.051	10-Mar-89	183	0.109
10-Jan-75	10	0.055	09-Mar-90	195	0.106
07-Feb-75	11	0.057			
07-Mar-75	12	0.061			
27-Jun-75	16	0.066			
25-Jul-75	17	0.072			
05-Dec-75	21	0.080			
08-Jun-76	27	0.091			
07-Jun-77	40	0.097			
07-Jun-78	52	0.101			

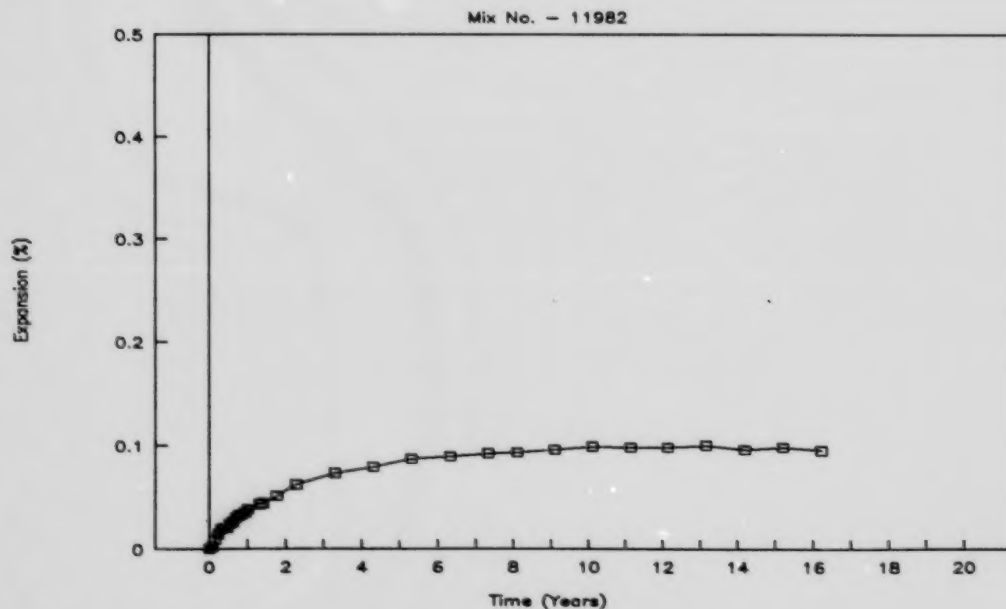


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11982 Aggregate: P-2052 EAR FALLS EXCAV
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : WESLEYVILLE/PICK
Date Cast : 11-Mar-74
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored in Container 142
Not all data were reported
White deposit on all bars (03-Jun-75)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
12-Mar-74	0	0.000	08-Jun-79	64	0.087
09-Apr-74	1	0.002	06-Jun-80	76	0.089
07-May-74	2	0.009	05-Jun-81	88	0.092
04-Jun-74	3	0.014	09-Mar-82	97	0.093
03-Jul-74	4	0.019	03-Mar-83	109	0.096
30-Jul-74	5	0.020	02-Mar-84	121	0.099
27-Aug-74	6	0.020	08-Mar-85	134	0.098
24-Sep-74	7	0.024	05-Mar-86	146	0.098
22-Oct-74	7	0.026	05-Mar-87	158	0.100
19-Nov-74	8	0.030	08-Mar-88	170	0.096
17-Dec-74	9	0.032	10-Mar-89	183	0.098
14-Jan-75	10	0.033	09-Mar-90	195	0.095
12-Feb-75	11	0.035			
11-Mar-75	12	0.038			
02-Jul-75	16	0.043			
29-Jul-75	17	0.044			
11-Dec-75	21	0.051			
11-Jun-76	27	0.062			
10-Jun-77	40	0.073			
09-Jun-78	52	0.079			

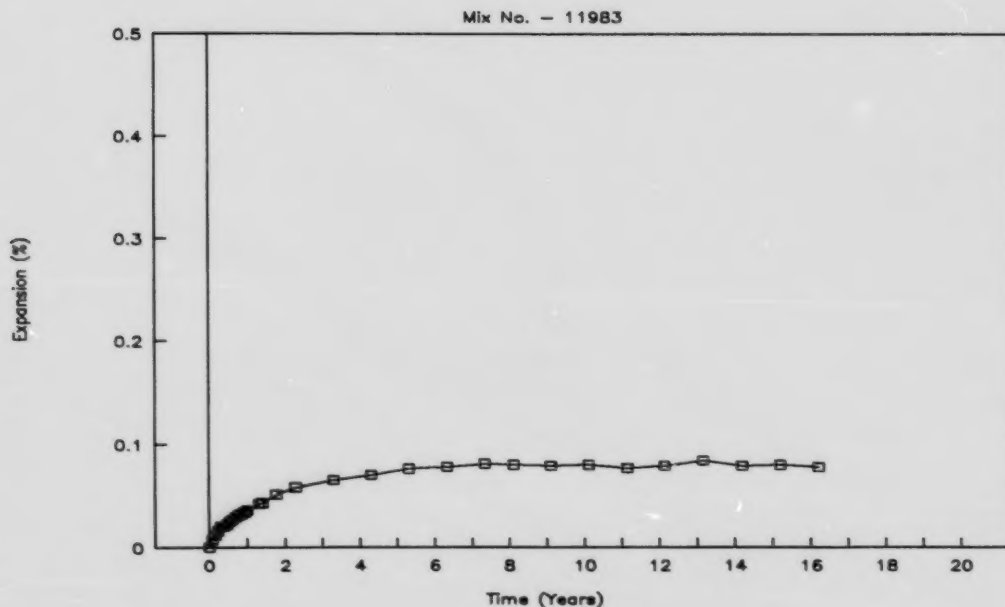


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 11983 Aggregate: P-2053 EAR FALSS EXCAV
 No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
 Project : WESLEYVILLE/PICK
 Date Cast : 11-Mar-74
 Age (as of Jan 1/90) : 16 years
 Remarks : Specimens stored in Container 143
 Not all data were reported

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
12-Mar-74	0	0.000	06-Jun-80	76	0.078
09-Apr-74	1	0.007	05-Jun-81	88	0.081
07-May-74	2	0.012	09-Mar-82	97	0.080
04-Jun-74	3	0.016	03-Mar-83	109	0.079
03-Jul-74	4	0.020	02-Mar-84	121	0.080
30-Jul-74	5	0.020	08-Mar-85	134	0.077
27-Aug-74	6	0.022	05-Mar-86	146	0.079
24-Sep-74	7	0.025	05-Mar-87	158	0.084
22-Oct-74	7	0.027	08-Mar-88	170	0.079
19-Nov-74	8	0.029	10-Mar-89	183	0.080
17-Dec-74	9	0.031	09-Mar-90	195	0.078
14-Jan-75	10	0.032			
12-Feb-75	11	0.034			
11-Mar-75	12	0.036			
02-Jul-75	16	0.042			
29-Jul-75	17	0.043			
11-Dec-75	21	0.051			
11-Jun-76	27	0.058			
10-Jun-77	40	0.065			
09-Jun-78	52	0.070			
08-Jun-79	64	0.076			



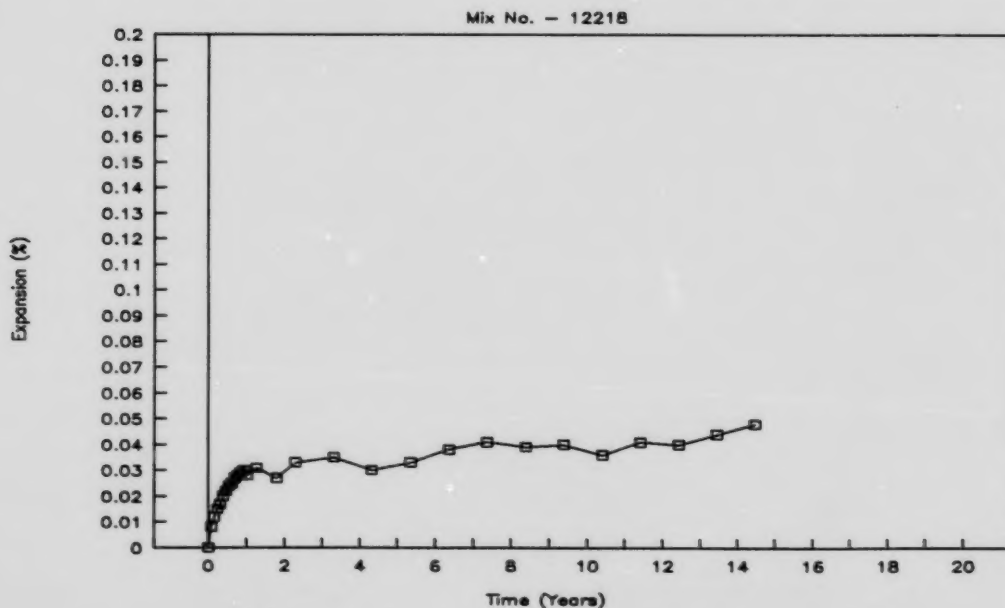
POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12218 Aggregate: S-6740 YUNDT PIT CR GR
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : BRUCE GS "B"
Date Cast : 01-Apr-75
Age (as of Jan 1/90) : 15 years
Remarks : Specimens stored in Pail 2
Not all data were reported
White and brown deposits on all bars (17-Sep-75)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Apr-75	0	0.000	07-Jul-81	76	0.038
30-Apr-75	1	0.008	06-Jul-82	88	0.041
29-May-75	2	0.012	06-Jul-83	101	0.039
25-Jun-75	3	0.015	06-Jul-84	113	0.040
23-Jul-75	4	0.017	05-Jul-85	125	0.036
20-Aug-75	5	0.020	04-Jul-86	137	0.041
17-Sep-75	6	0.022	07-Jul-87	149	0.040
15-Oct-75	7	0.024	06-Jul-88	161	0.044
12-Nov-75	7	0.025	06-Jul-89	174	0.048
10-Dec-75	8	0.027			
07-Jan-76	9	0.028			
04-Feb-76	10	0.029			
03-Mar-76	11	0.030			
01-Apr-76	12	0.028			
01-Jul-76	15	0.031			
07-Jan-77	22	0.027			
07-Jul-77	28	0.033			
07-Jul-78	40	0.035			
06-Jul-79	52	0.030			
08-Jul-80	64	0.033			

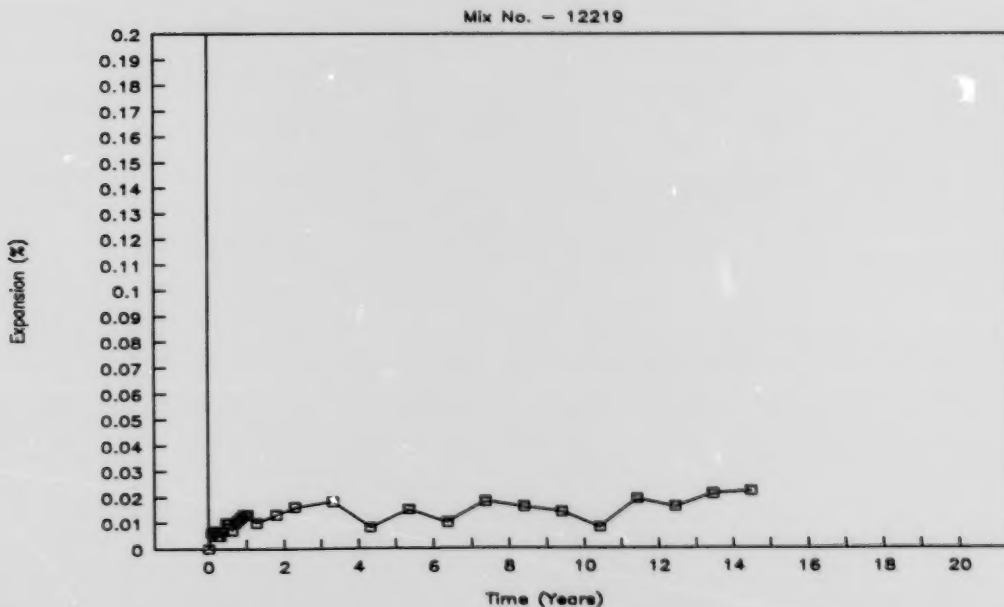


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 12219	Aggregate: S-6740 YUNDT PIT CR GR
No. of Specimens : 4	Cement: 80% CL67942 LAB. STD. (ALK 1.16%)
Project : BRUCE GS "B"	Fly Ash: 20% CL68034
Date Cast : 01-Apr-75	
Age (as of Jan 1/90) : 15 years	
Remarks : Specimens stored in Pail 2	
Not all data were reported	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Apr-75	0	0.000	06-Jul-82	88	0.018
30-Apr-75	1	0.006	06-Jul-83	101	0.016
29-May-75	2	0.007	06-Jul-84	113	0.014
25-Jun-75	3	0.005	05-Jul-85	125	0.008
23-Jul-75	4	0.005	04-Jul-86	137	0.019
20-Aug-75	5	0.007	07-Jul-87	149	0.016
17-Sep-75	6	0.010	06-Jul-88	161	0.021
15-Oct-75	7	0.010	06-Jul-89	174	0.022
12-Nov-75	7	0.007			
10-Dec-75	8	0.010			
07-Jan-76	9	0.011			
04-Feb-76	10	0.012			
03-Mar-76	11	0.013			
01-Apr-76	12	0.013			
01-Jul-76	15	0.010			
07-Jan-77	22	0.013			
07-Jul-77	28	0.016			
07-Jul-78	40	0.018			
06-Jul-79	52	0.008			
08-Jul-80	64	0.015			
07-Jul-81	76	0.010			

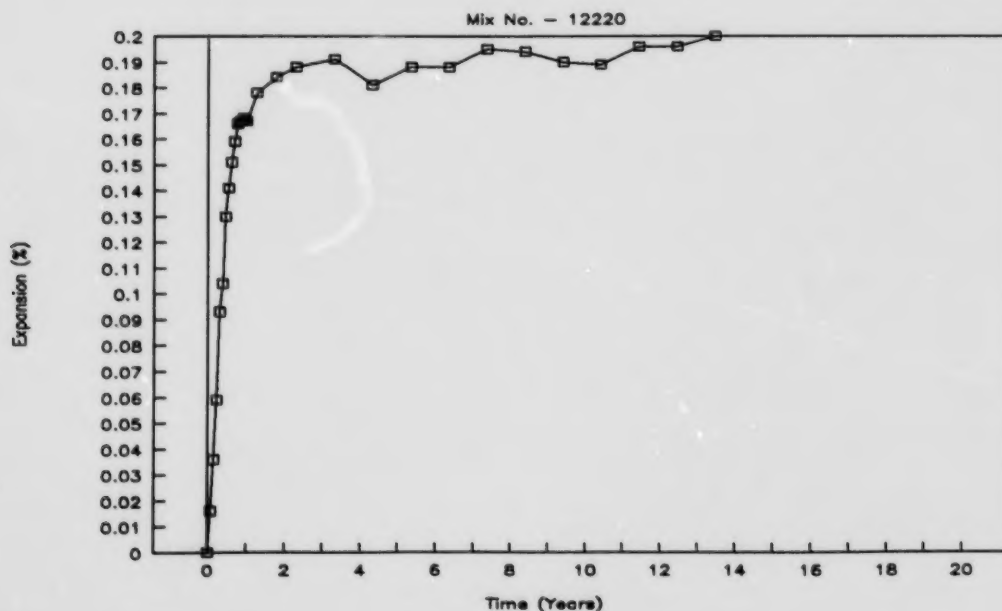


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 12220 Aggregate: S-6740 YUNDT PIT CR GR
 No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 2.0%)
 Project : BRUCE GS "B"
 Date Cast : 03-Apr-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored in Pail 2
 Not all data were reported
 Severe white and dark spots (17-Oct-75)
 White areas built up on surface of bars (05-Mar-76)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Apr-75	0	0.000	08-Jul-80	64	0.188
02-May-75	1	0.016	07-Jul-81	76	0.188
30-May-75	2	0.036	06-Jul-82	88	0.195
27-Jun-75	3	0.059	06-Jul-83	101	0.194
25-Jul-75	4	0.093	06-Jul-84	113	0.190
22-Aug-75	5	0.104	05-Jul-85	125	0.189
19-Sep-75	6	0.130	04-Jul-86	137	0.196
17-Oct-75	7	0.141	07-Jul-87	149	0.196
14-Nov-75	7	0.151	06-Jul-88	161	0.200
12-Dec-75	8	0.159	06-Jul-89	174	0.202
09-Jan-76	9	0.166			
06-Feb-76	10	0.167			
05-Mar-76	11	0.168			
02-Apr-76	12	0.167			
06-Jul-76	15	0.178			
07-Jan-77	21	0.184			
07-Jul-77	28	0.188			
07-Jul-78	40	0.191			
06-Jul-79	52	0.181			

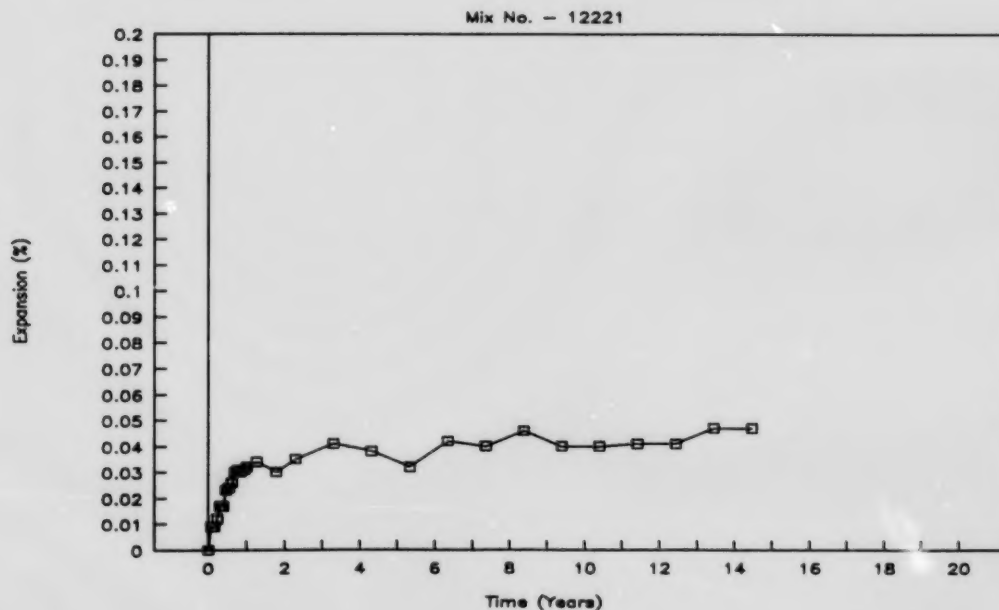


POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 12221	Aggregate: S-6740 YUNDT PIT CR GR
No. of Specimens : 4	Cement: 80% CL67942 LAB. STD. (ALK 2.0%)
Project : BRUCE GS "B"	Fly Ash: 20% CL68034
Date Cast : 03-Apr-75	
Age (as of Jan 1/90) : 15 years	
Remarks : Specimens stored in Pail 2	
Not all data were reported	
Starting of white and dark deposits (10-Feb-76)	
Severe white and dark spots (17-Oct-75)	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Apr-75	0	0.000	08-Jul-80	64	0.032
02-May-75	1	0.009	07-Jul-81	76	0.042
30-May-75	2	0.009	06-Jul-82	88	0.040
27-Jun-75	3	0.012	06-Jul-83	101	0.046
25-Jul-75	4	0.017	06-Jul-84	113	0.040
22-Aug-75	5	0.017	05-Jul-85	125	0.040
19-Sep-75	6	0.023	04-Jul-86	137	0.041
17-Oct-75	7	0.024	07-Jul-87	149	0.041
14-Nov-75	7	0.026	06-Jul-88	161	0.047
12-Dec-75	8	0.030	06-Jul-89	174	0.047
09-Jan-76	9	0.031			
06-Feb-76	10	0.030			
05-Mar-76	11	0.031			
02-Apr-76	12	0.032			
06-Jul-76	15	0.034			
07-Jan-77	21	0.030			
07-Jul-77	28	0.035			
07-Jul-78	40	0.041			
06-Jul-79	52	0.038			



ASTM C 227

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Jul-75	0	0.000	24-Jul-81	73	0.036
26-Aug-75	1	0.001	22-Jul-82	85	0.038
23-Sep-75	2	0.009	21-Jul-83	97	0.039
21-Oct-75	3	0.010	31-Jul-84	110	0.036
18-Nov-75	4	0.011	26-Jul-85	122	0.035
16-Dec-75	5	0.013	25-Jul-86	134	0.025
13-Jan-76	6	0.018	28-Jul-87	146	0.034
10-Feb-76	7	0.020	27-Jul-88	158	0.039
09-Mar-76	7	0.022	27-Jul-89	170	0.040
06-Apr-76	8	0.024			
04-May-76	9	0.024			
02-Jun-76	10	0.027			
29-Jun-76	11	0.026			
30-Jul-76	12	0.026			
29-Oct-76	15	0.029			
28-Jan-77	18	0.032			
29-Jul-77	24	0.032			
28-Jul-78	37	0.033			
27-Jul-79	49	0.032			
25-Jul-80	61	0.035			



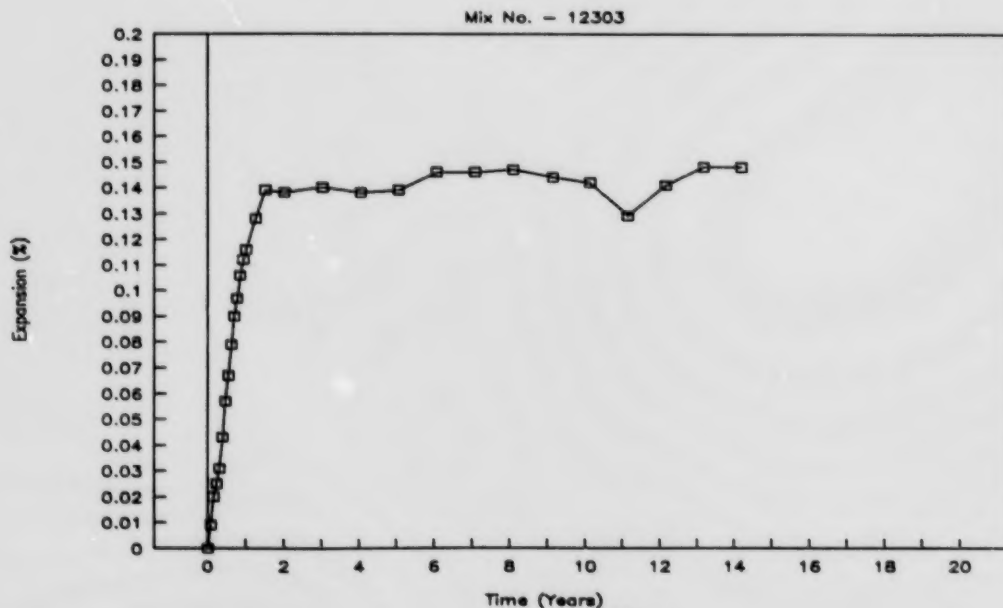
POTENTIAL ALKALI REACTIVITY OF CEMENT AGGREGATE COMBINATIONS
(MORTAR BAR METHOD)

ASTM C 227

Mix No. : 12303 Aggregate: S-6608 WEST PARIS SAND
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 2.0%)
Project : BRUCE GS "B"
Date Cast : 28-Jul-75
Age (as of Jan 1/90) : 14 years
Remarks : Specimens stored in Pail 3
Not all data were reported
Starting of white and dark deposits (18-Nov-75)
Severe white and brown deposits (10-Feb-76)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Jul-75	0	0.000	25-Jul-80	61	0.139
26-Aug-75	1	0.009	24-Jul-81	73	0.146
23-Sep-75	2	0.020	22-Jul-82	85	0.146
21-Oct-75	3	0.025	21-Jul-83	97	0.147
18-Nov-75	4	0.031	31-Jul-84	110	0.144
16-Dec-75	5	0.043	26-Jul-85	122	0.142
13-Jan-76	6	0.057	25-Jul-86	134	0.129
10-Feb-76	7	0.067	28-Jul-87	146	0.141
09-Mar-76	7	0.079	27-Jul-88	158	0.148
06-Apr-76	8	0.090	27-Jul-89	170	0.148
04-May-76	9	0.097			
02-Jun-76	10	0.106			
29-Jun-76	11	0.112			
30-Jul-76	12	0.116			
29-Oct-76	15	0.128			
28-Jan-77	18	0.139			
29-Jul-77	24	0.138			
28-Jul-78	37	0.140			
27-Jul-79	49	0.138			



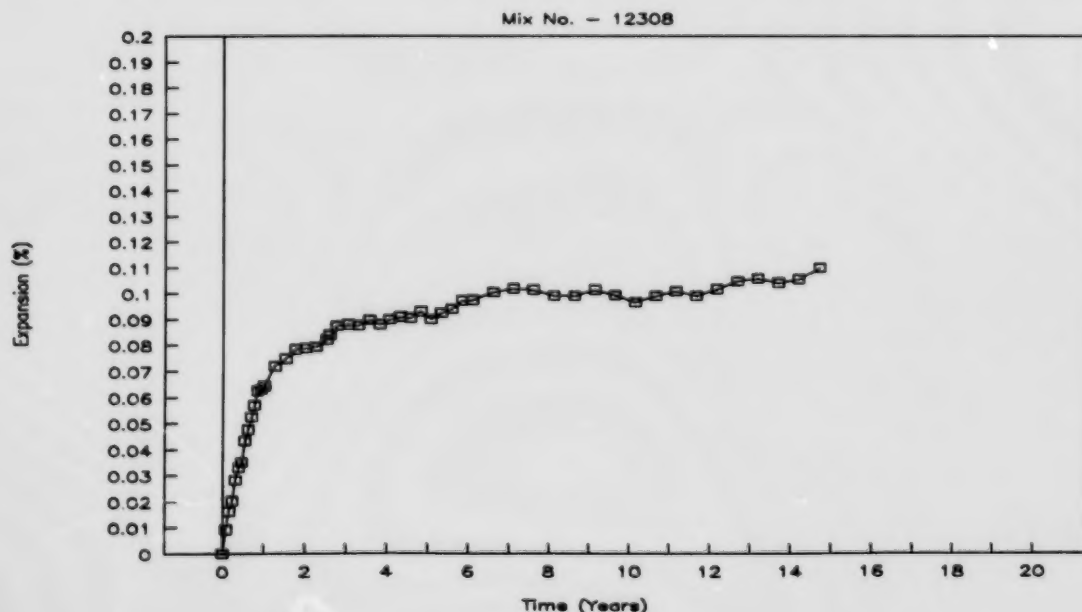
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12308 Aggregate: S-6437 EAST PARIS CR GR
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 2.0%)
Project : BRUCE GS "B"
Date Cast : 05-Aug-75
Age (as of Jan 1/90) : 14 years
Remarks : Specimen stored in Container 160
Dark brown and white spots on specimens (01-Oct-75, 21-Jan-76, 15-Apr-76)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Aug-75	0	0.000	03-Mar-78	31	0.084	08-Aug-84	110	0.102
03-Sep-75	1	0.009	03-May-78	33	0.087	06-Feb-85	116	0.100
01-Oct-75	2	0.016	09-Aug-78	37	0.088	07-Aug-85	122	0.097
29-Oct-75	3	0.020	08-Nov-78	40	0.088	06-Feb-86	128	0.099
26-Nov-75	4	0.028	12-Feb-79	43	0.090	06-Aug-86	134	0.101
24-Dec-75	5	0.033	08-May-79	46	0.088	06-Feb-87	140	0.099
21-Jan-76	6	0.035	08-Aug-79	49	0.090	06-Aug-87	146	0.102
18-Feb-76	7	0.043	08-Nov-79	52	0.091	05-Feb-88	152	0.105
17-Mar-76	7	0.048	08-Feb-80	55	0.090	05-Aug-88	158	0.106
15-Apr-76	8	0.052	08-May-80	58	0.093	03-Feb-89	164	0.104
12-May-76	9	0.057	06-Aug-80	61	0.090	04-Aug-89	170	0.106
09-Jun-76	10	0.062	07-Nov-80	64	0.093	06-Feb-90	177	0.110
07-Jul-76	11	0.063	06-Feb-81	67	0.094			
06-Aug-76	12	0.064	08-May-81	70	0.097			
08-Nov-76	15	0.072	07-Aug-81	73	0.098			
08-Feb-77	18	0.075	09-Feb-82	79	0.101			
06-May-77	21	0.078	09-Aug-82	85	0.102			
05-Aug-77	24	0.079	04-Feb-83	91	0.102			
03-Nov-77	27	0.080	05-Aug-83	97	0.099			
03-Feb-78	30	0.082	07-Feb-84	104	0.099			



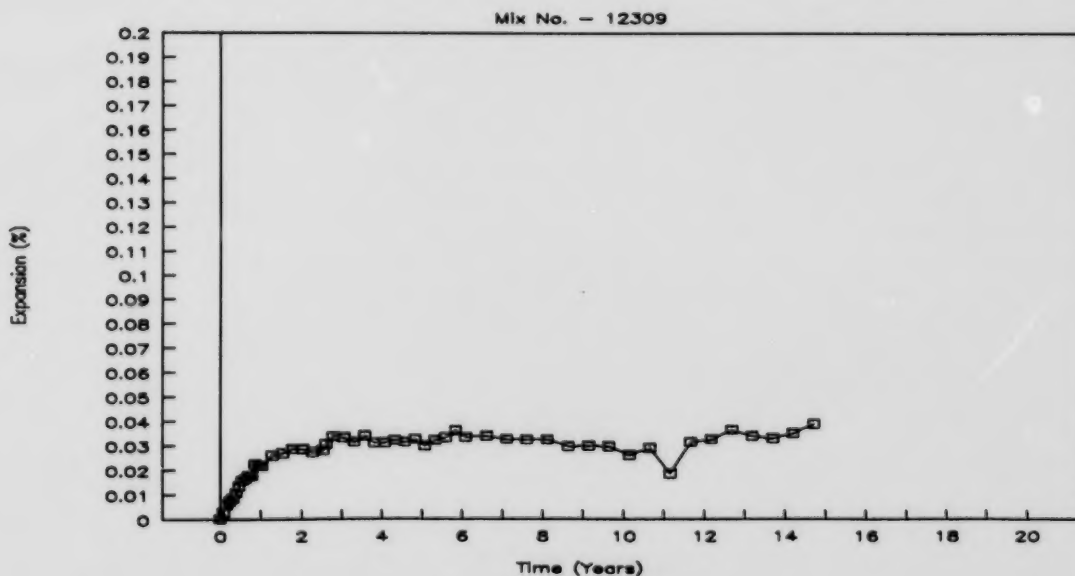
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12309 Aggregate: S-6437 EAST PARIS CR GR
No. of Specimens : 4 Cement: 80% CL67942 LAB. STD. (ALK 2.0%)
Project : BRUCE GS "B" Fly Ash: 20% CL68034
Date Cast : 05-Aug-75
Age (as of Jan 1/90) : 14 years
Remarks : Specimens stored in Container 161
White and dark spots on specimens (21-Jan-76)
Container dry (06-Aug-86)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Aug-75	0	0.000	03-Mar-78	31	0.030	08-Aug-84	110	0.030
03-Sep-75	1	0.003	03-May-78	33	0.034	06-Feb-85	116	0.030
01-Oct-75	2	0.006	09-Aug-78	37	0.033	07-Aug-85	122	0.026
29-Oct-75	3	0.007	08-Nov-78	40	0.032	06-Feb-86	128	0.029
26-Nov-75	4	0.009	12-Feb-79	43	0.034	06-Aug-86	134	0.019
24-Dec-75	5	0.011	08-May-79	46	0.031	06-Feb-87	140	0.032
21-Jan-76	6	0.014	08-Aug-79	49	0.031	06-Aug-87	146	0.033
18-Feb-76	7	0.016	08-Nov-79	52	0.032	05-Feb-88	152	0.037
17-Mar-76	7	0.016	08-Feb-80	55	0.031	05-Aug-88	158	0.034
15-Apr-76	8	0.017	08-May-80	58	0.033	03-Feb-89	164	0.033
12-May-76	9	0.018	06-Aug-80	61	0.030	04-Aug-89	170	0.035
09-Jun-76	10	0.022	07-Nov-80	64	0.032	06-Feb-90	177	0.039
07-Jul-76	11	0.022	06-Feb-81	67	0.033			
06-Aug-76	12	0.022	08-May-81	70	0.036			
08-Nov-76	15	0.026	07-Aug-81	73	0.034			
08-Feb-77	18	0.027	09-Feb-82	79	0.034			
06-May-77	21	0.029	09-Aug-82	85	0.033			
05-Aug-77	24	0.029	04-Feb-83	91	0.033			
03-Nov-77	27	0.027	05-Aug-83	97	0.033			
03-Feb-78	30	0.028	07-Feb-84	104	0.030			



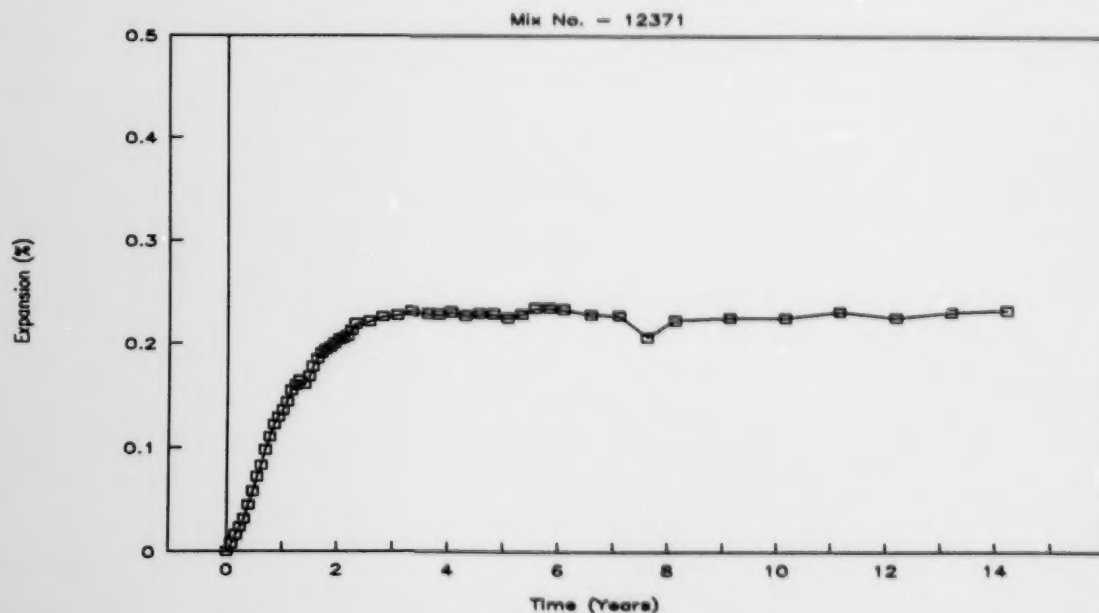
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12371 Aggregate: S-6788 PANCAKE LAKE CHERT RICH MAGNETITE
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : SELECTED AGGREGATES
Date Cast : 23-Oct-75
Age (as of Jan 1/90) : 14 years
Remarks : Specimens stored in Container 169

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
24-Oct-75	0	0.000	06-May-77	19	0.178	24-Jul-80	58	0.230
21-Nov-75	1	0.007	03-Jun-77	20	0.186	24-Oct-80	61	0.226
22-Dec-75	2	0.016	30-Jun-77	21	0.191	23-Jan-81	64	0.230
16-Jan-76	3	0.024	29-Jul-77	21	0.195	24-Apr-81	67	0.236
13-Feb-76	4	0.031	26-Aug-77	22	0.197	24-Jul-81	70	0.236
12-Mar-76	5	0.045	23-Sep-77	23	0.201	23-Oct-81	73	0.235
09-Apr-76	6	0.058	25-Oct-77	24	0.205	23-Apr-82	79	0.229
07-May-76	7	0.072	18-Nov-77	25	0.206	22-Oct-82	85	0.229
04-Jun-76	7	0.083	16-Dec-77	26	0.208	26-Apr-83	91	0.208
01-Jul-76	8	0.098	13-Jan-78	27	0.213	27-Oct-83	98	0.224
30-Jul-76	9	0.110	10-Feb-78	28	0.219	23-Oct-84	110	0.227
27-Aug-76	10	0.122	10-May-78	31	0.222	23-Oct-85	122	0.227
24-Sep-76	11	0.130	03-Aug-78	34	0.226	23-Oct-86	134	0.233
22-Oct-76	12	0.136	09-Nov-78	37	0.228	27-Oct-87	146	0.227
19-Nov-76	13	0.144	09-Feb-79	40	0.232	21-Oct-88	158	0.232
17-Dec-76	14	0.155	23-May-79	44	0.230	24-Oct-89	170	0.234
14-Jan-77	15	0.160	02-Aug-79	46	0.230			
11-Feb-77	16	0.165	24-Oct-79	49	0.232			
11-Mar-77	17	0.161	24-Jan-80	52	0.228			
10-Apr-77	18	0.168	25-Apr-80	55	0.231			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

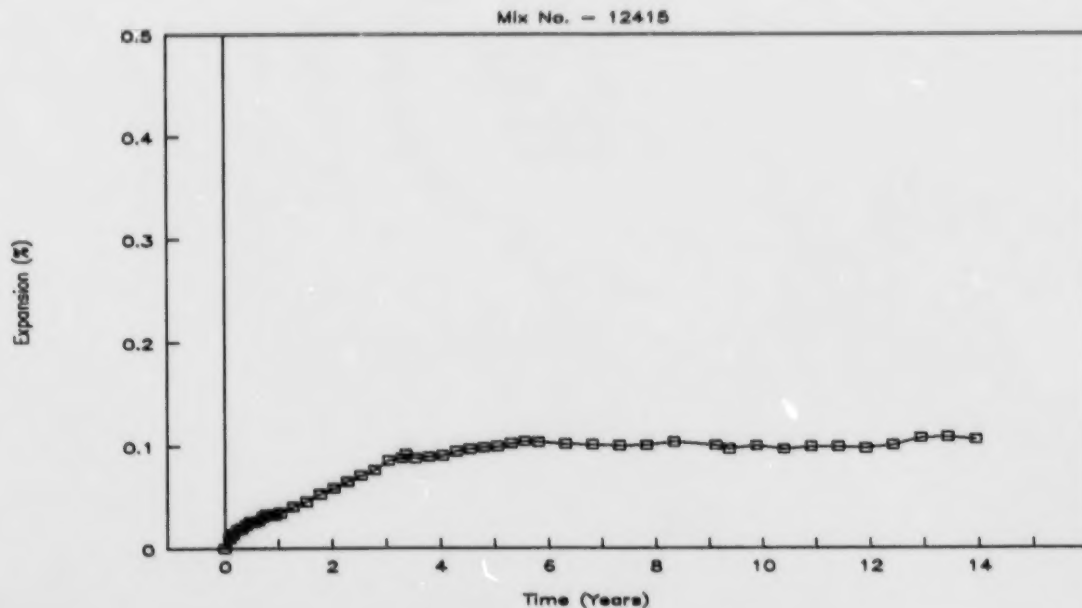
ASTM C 227

Mix No. : 12415
No. of Specimens : 4
Project : SELECTED AGGREGATES
Date Cast : 11-Dec-75
Age (as of Jan 1/90) : 14 years
Remarks : Specimens stored in Container 170

Aggregate: S-6790 BEAUHARNOIS GRAVEL
Cement: CL67942 LAB. STD. (ALK 1.16%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
12-Dec-75	0	0.000	08-Sep-78	33	0.075	08-Mar-85	112	0.096
09-Jan-76	1	0.010	11-Dec-78	37	0.085	11-Sep-85	119	0.099
06-Feb-76	2	0.014	09-Mar-79	39	0.088	12-Mar-86	125	0.096
04-Mar-76	3	0.018	06-Apr-79	40	0.091	11-Sep-86	131	0.098
02-Apr-76	4	0.019	08-Jun-79	42	0.087	11-Mar-87	137	0.099
03-May-76	5	0.022	07-Sep-79	46	0.088	11-Sep-87	143	0.097
28-May-76	6	0.026	06-Dec-79	49	0.090	11-Mar-88	149	0.100
25-Jun-76	7	0.025	07-Mar-80	52	0.094	09-Sep-88	155	0.107
23-Jul-76	7	0.027	06-Jun-80	55	0.096	10-Mar-89	161	0.108
20-Aug-76	8	0.030	05-Sep-80	58	0.098	08-Sep-89	167	0.106
17-Sep-76	9	0.032	05-Dec-80	61	0.099			
15-Oct-76	10	0.032	06-Mar-81	64	0.102			
12-Nov-76	11	0.032	05-Jun-81	67	0.104			
16-Dec-76	12	0.034	04-Sep-81	70	0.103			
11-Mar-77	15	0.040	05-Mar-82	76	0.101			
10-Jun-77	18	0.045	03-Sep-82	82	0.101			
09-Sep-77	21	0.053	03-Mar-83	88	0.100			
09-Dec-77	24	0.058	02-Sep-83	94	0.100			
10-Mar-78	27	0.064	02-Mar-84	100	0.103			
09-Jun-78	30	0.071	11-Dec-84	110	0.100			



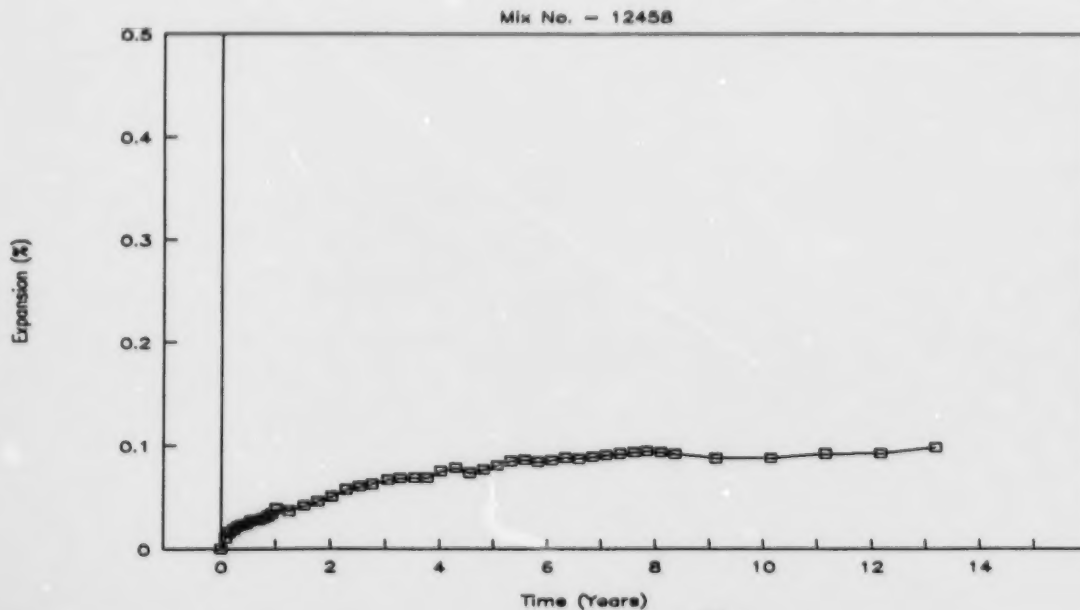
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12458 Aggregate: S-6790 BEAUHARNOIS GRAVEL
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : SELECTED AGGREGATES
Date Cast : 25-Mar-76
Age (as of Jan 1/90) : 14 years
Remarks : Specimens stored in Container 175

TEST DATA

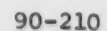
Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-Mar-76	0	0.000	14-Dec-78	33	0.062	20-Dec-83	94	0.095
23-Apr-76	1	0.011	28-Mar-79	37	0.066	23-Mar-84	97	0.094
21-May-76	2	0.016	19-Jun-79	39	0.068	26-Jun-84	100	0.092
18-Jun-76	3	0.019	21-Sep-79	42	0.069	26-Mar-85	110	0.088
16-Jul-76	4	0.022	14-Dec-79	45	0.069	25-Mar-86	122	0.088
13-Aug-76	5	0.023	14-Mar-80	48	0.075	24-Mar-87	134	0.092
10-Sep-76	6	0.024	20-Jun-80	52	0.079	23-Mar-88	146	0.093
08-Oct-76	7	0.027	23-Sep-80	55	0.074	23-Mar-89	158	0.098
05-Nov-76	7	0.028	24-Dec-80	58	0.077			
03-Dec-76	8	0.028	25-Mar-81	61	0.081			
30-Dec-76	9	0.030	24-Jun-81	64	0.085			
28-Jan-77	10	0.031	25-Sep-81	67	0.087			
25-Feb-77	11	0.034	23-Dec-81	70	0.084			
25-Mar-77	12	0.039	24-Mar-82	73	0.086			
17-Jun-77	15	0.037	24-Jun-82	76	0.088			
23-Sep-77	18	0.042	24-Sep-82	79	0.087			
23-Dec-77	21	0.046	23-Dec-82	82	0.089			
23-Mar-78	24	0.051	23-Mar-83	85	0.091			
27-Jun-78	27	0.057	24-Jun-83	88	0.092			
21-Sep-78	30	0.061	28-Sep-83	91	0.094			



ASTM C 227

Aggregate: S-6790 BEAUHARNOIS GRAVEL
Cement: CL67942 LAB. STD. (ALK 2.0%)

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
30-Mar-76	0	0.000	28-Mar-79	36	0.149	27-Mar-84	97	0.254
27-Apr-76	1	0.016	28-Jun-79	40	0.159	28-Jun-84	100	0.257
26-May-76	2	0.023	28-Sep-79	43	0.171	28-Sep-84	103	0.257
22-Jun-76	3	0.026	28-Dec-79	46	0.181	28-Mar-85	110	0.249
20-Jul-76	4	0.031	28-Mar-80	49	0.193	27-Jun-85	113	0.255
17-Aug-76	5	0.037	27-Jun-80	52	0.202	27-Sep-85	116	0.255
14-Sep-76	6	0.038	26-Sep-80	55	0.203	25-Oct-85	117	0.254
13-Oct-76	7	0.042	30-Dec-80	58	0.213	27-Mar-86	122	0.249
09-Nov-76	7	0.045	27-Mar-81	61	0.224	26-Sep-86	128	0.254
07-Dec-76	8	0.049	24-Jun-81	64	0.236	26-Mar-87	134	0.254
04-Jan-77	9	0.055	29-Sep-81	67	0.261	29-Sep-87	140	0.253
01-Feb-77	10	0.058	23-Dec-81	70	0.259	25-Mar-88	146	0.253
01-Mar-77	11	0.062	30-Mar-82	73	0.258	23-Sep-88	152	0.259
29-Mar-77	12	0.066	24-Jun-82	76	0.260	23-Mar-89	158	0.255
28-Sep-77	18	0.062	24-Sep-82	79	0.244	26-Sep-89	164	0.259
28-Dec-77	21	0.080	23-Dec-82	82	0.249			
29-Mar-78	24	0.096	25-Mar-83	85	0.250			
30-Jun-78	27	0.115	24-Jun-83	88	0.258			
28-Sep-78	30	0.131	28-Sep-83	91	0.257			
21-Dec-78	33	0.138	20-Dec-83	94	0.254			



ASTM C 227

TEST DATA

90-210

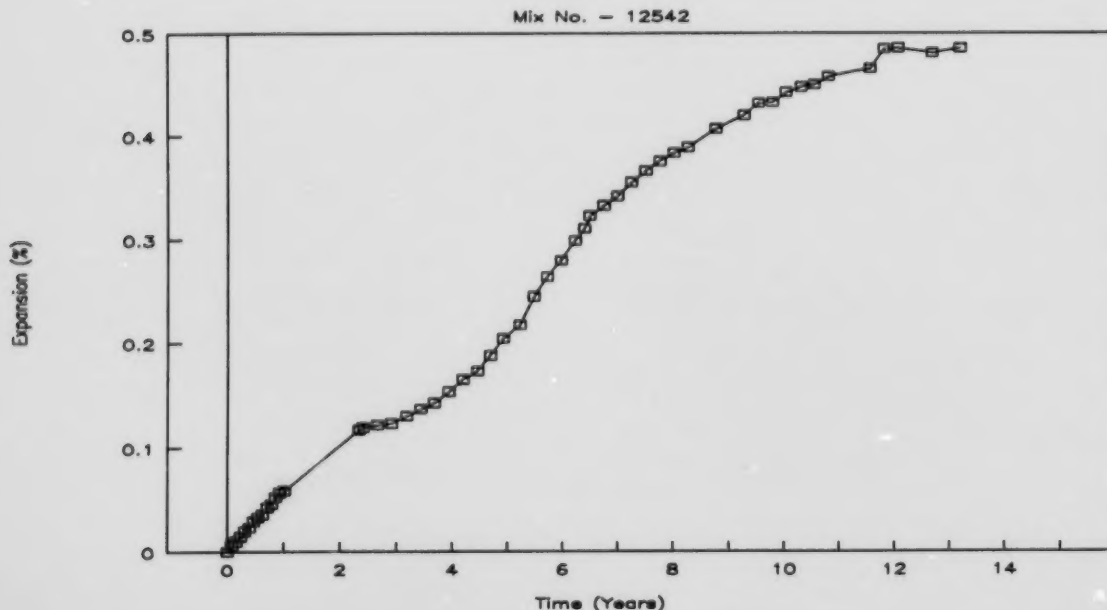
90-210

POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 12542 Aggregate: S-6345 LOWER NOTCH CR RK
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : SELECTED AGGREGATES
Date Cast : 30-Sep-76
Age (as of Jan 1/90) : 13 years
Remarks : Specimens stored in Container 181
Data between Oct 77 and Dec 78 have been omitted
Crystals forming on sides of specimens (15-Apr-77)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
01-Oct-76	0	0.000	16-May-80	44	0.143	23-May-85	105	0.407
29-Oct-76	1	0.006	20-Aug-80	47	0.153	22-Nov-85	111	0.420
26-Nov-76	2	0.010	18-Nov-80	50	0.165	21-Feb-86	114	0.432
24-Dec-76	3	0.014	20-Feb-81	53	0.173	23-May-86	117	0.433
21-Jan-77	4	0.019	15-May-81	56	0.188	22-Aug-86	120	0.443
18-Feb-77	5	0.023	07-Aug-81	59	0.205	25-Nov-86	124	0.448
18-Mar-77	6	0.029	24-Nov-81	63	0.218	24-Feb-87	127	0.450
15-Apr-77	7	0.032	25-Feb-82	66	0.246	22-May-87	130	0.458
13-May-77	7	0.036	21-May-82	69	0.264	19-Feb-88	139	0.466
10-Jun-77	8	0.042	20-Aug-82	72	0.280	20-May-88	142	0.485
08-Jul-77	9	0.045	19-Nov-82	75	0.299	19-Aug-88	145	0.486
05-Aug-77	10	0.052	21-Jan-83	77	0.311	30-Mar-89	152	0.481
02-Sep-77	11	0.056	23-Feb-83	78	0.323	29-Sep-89	158	0.485
30-Sep-77	12	0.059	26-May-83	81	0.333			
19-Jan-79	28	0.117	23-Aug-83	84	0.342			
16-Feb-79	29	0.119	22-Nov-83	87	0.356			
16-May-79	32	0.122	23-Feb-84	90	0.366			
16-Aug-79	35	0.123	23-May-84	93	0.376			
23-Nov-79	38	0.130	23-Aug-84	96	0.384			
22-Feb-80	41	0.137	23-Nov-84	99	0.389			



ASTM C 227

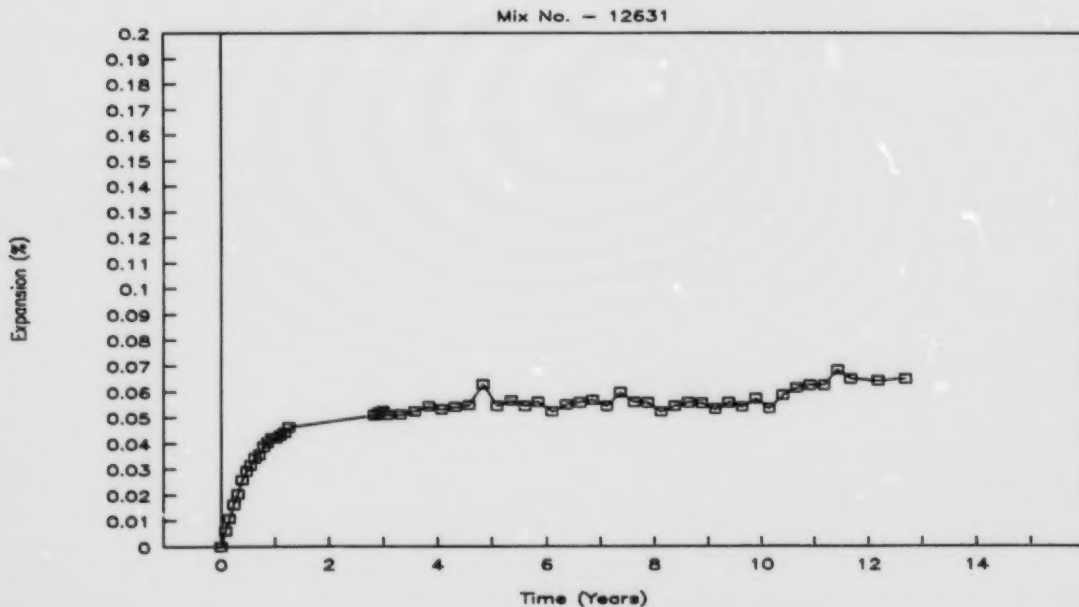
TEST DATA

ASTM C 227

Brown and white spots on specimens (05-Oct-77, 22-Feb-78)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
13-Jul-77	0	0.000	18-Jul-80	37	0.051	16-Jul-85	98	0.052
10-Aug-77	1	0.006	17-Oct-80	40	0.051	16-Oct-85	101	0.055
07-Sep-77	2	0.011	19-Jan-81	43	0.052	15-Jan-86	104	0.056
05-Oct-77	3	0.016	22-Apr-81	46	0.054	15-Apr-86	107	0.056
02-Nov-77	4	0.020	16-Jul-81	49	0.053	15-Jul-86	110	0.053
01-Dec-77	5	0.026	16-Oct-81	52	0.054	15-Oct-86	113	0.056
28-Dec-77	6	0.029	15-Jan-82	55	0.055	13-Jan-87	116	0.054
25-Jan-78	7	0.032	15-Apr-82	58	0.063	15-Apr-87	119	0.057
22-Feb-78	7	0.034	16-Jul-82	61	0.055	15-Jul-87	122	0.054
22-Mar-78	8	0.036	19-Oct-82	64	0.057	15-Oct-87	125	0.059
21-Apr-78	9	0.039	18-Jan-83	67	0.055	15-Jan-88	128	0.062
17-May-78	10	0.040	15-Apr-83	70	0.056	15-Apr-88	131	0.063
15-Jun-78	11	0.042	15-Jul-83	73	0.052	19-Jul-88	134	0.063
12-Jul-78	12	0.042	21-Oct-83	76	0.055	18-Oct-88	137	0.069
11-Aug-78	13	0.043	17-Jan-84	79	0.056	12-Jan-89	140	0.065
08-Sep-78	14	0.044	13-Apr-84	82	0.057	12-Jul-89	146	0.064
06-Oct-78	15	0.046	17-Jul-84	85	0.055	12-Jan-90	152	0.065
25-Apr-80	34	0.051	16-Oct-84	88	0.060			
23-May-80	35	0.052	15-Jan-85	91	0.056			
20-Jun-80	36	0.053	16-Apr-85	94	0.056			



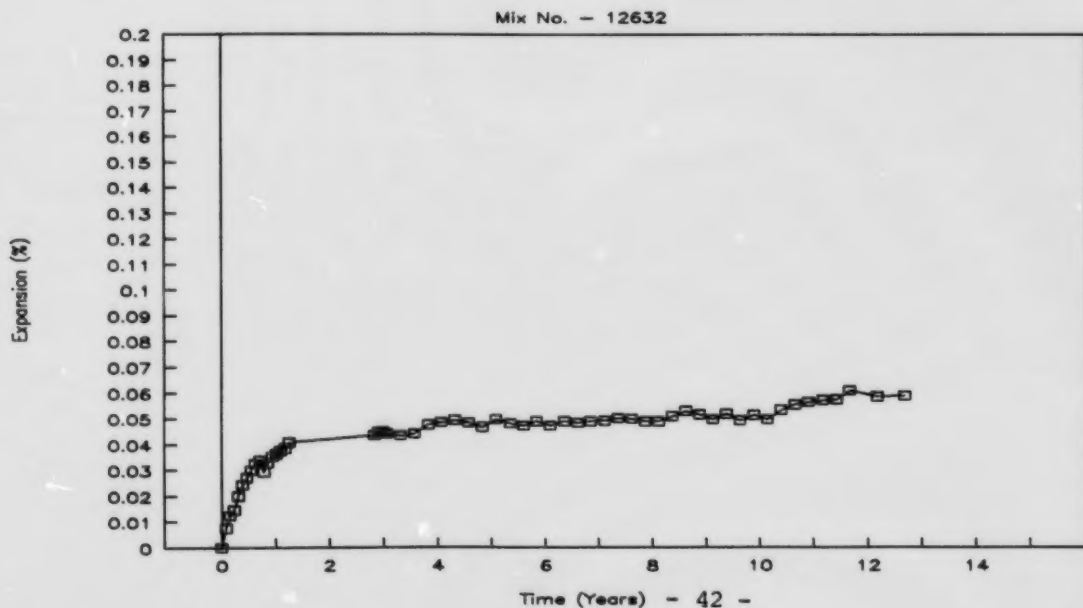
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12632 Aggregate: S-6956 CHAPPELL CR GR 1 1/2"
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : BRUCE GS "B"
Date Cast : 12-Jul-77
Age (as of Jan 1/90) : 12 years
Remarks : Specimens stored in Container 191
Data from Dec 78 to Mar 80 have been omitted
Brown and white spots on specimens (22-Feb-78)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
13-Jul-77	0	0.000	18-Jul-80	37	0.044	16-Jul-85	98	0.049
10-Aug-77	1	0.008	17-Oct-80	40	0.043	16-Oct-85	101	0.051
07-Sep-77	2	0.012	19-Jan-81	43	0.044	15-Jan-86	104	0.053
05-Oct-77	3	0.015	22-Apr-81	46	0.048	15-Apr-86	107	0.052
02-Nov-77	4	0.020	16-Jul-81	49	0.049	15-Jul-86	110	0.050
01-Dec-77	5	0.024	16-Oct-81	52	0.050	15-Oct-86	113	0.052
28-Dec-77	6	0.027	15-Jan-82	55	0.049	13-Jan-87	116	0.050
25-Jan-78	7	0.030	15-Apr-82	58	0.047	15-Apr-87	119	0.052
22-Feb-78	7	0.033	16-Jul-82	61	0.050	15-Jul-87	122	0.050
22-Mar-78	8	0.034	19-Oct-82	64	0.048	15-Oct-87	125	0.054
21-Apr-78	9	0.029	18-Jan-83	67	0.047	15-Jan-88	128	0.056
17-May-78	10	0.033	15-Apr-83	70	0.049	15-Apr-88	131	0.057
15-Jun-78	11	0.035	15-Jul-83	73	0.047	19-Jul-88	134	0.057
12-Jul-78	12	0.036	21-Oct-83	76	0.049	18-Oct-88	137	0.058
11-Aug-78	13	0.037	17-Jan-84	79	0.049	12-Jan-89	140	0.061
08-Sep-78	14	0.038	13-Apr-84	82	0.049	12-Jul-89	146	0.059
06-Oct-78	15	0.041	17-Jul-84	85	0.049	12-Jan-90	152	0.059
25-Apr-80	34	0.043	16-Oct-84	88	0.050			
23-May-80	35	0.045	15-Jan-85	91	0.050			
20-Jun-80	36	0.045	16-Apr-85	94	0.049			



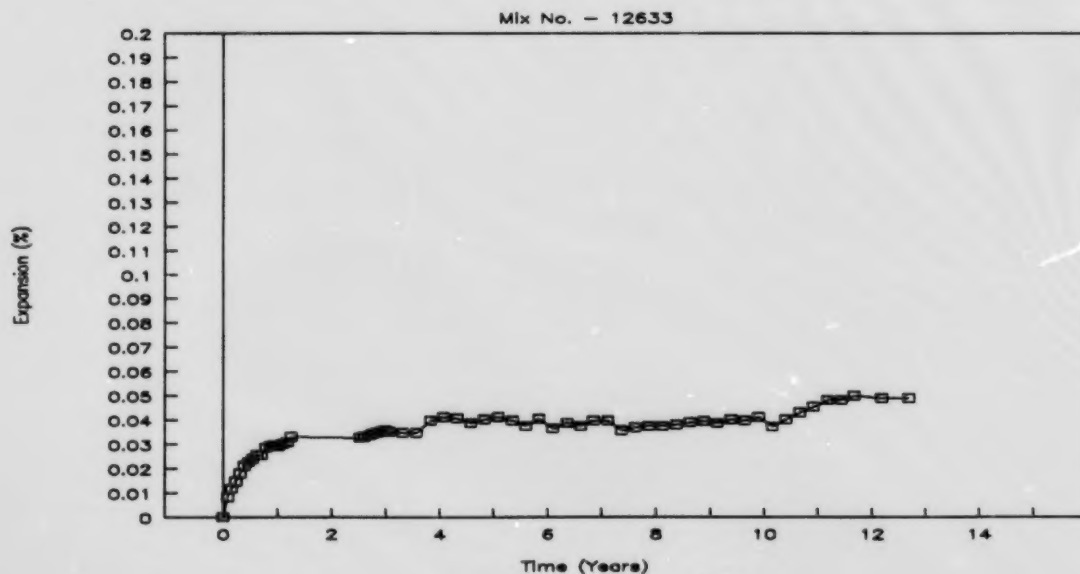
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 12633 Aggregate: S-6957 CHAPPELL CR GR 3/4"
No. of Specimens : 4 Cement: CL67942 LAB. STD. (ALK 1.16%)
Project : BRUCE GS "B"
Date Cast : 12-Jul-77
Age (as of Jan 1/90) : 12 years
Remarks : Specimens stored in Container 192
Data from Dec 78 to Dec 79 have been omitted
Brown and white spots on specimens (05-Oct-77, 22-Feb-78)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
13-Jul-77	0	0.000	25-Apr-80	34	0.035	15-Jan-85	91	0.037
10-Aug-77	1	0.008	23-May-80	35	0.035	16-Apr-85	94	0.038
07-Sep-77	2	0.012	20-Jun-80	36	0.036	16-Jul-85	98	0.038
05-Oct-77	3	0.015	18-Jul-80	37	0.035	16-Oct-85	101	0.038
02-Nov-77	4	0.018	17-Oct-80	40	0.035	15-Jan-86	104	0.039
01-Dec-77	5	0.021	19-Jan-81	43	0.035	15-Apr-86	107	0.040
28-Dec-77	6	0.023	22-Apr-81	46	0.040	15-Jul-86	110	0.039
25-Jan-78	7	0.024	16-Jul-81	49	0.041	15-Oct-86	113	0.040
22-Feb-78	7	0.026	16-Oct-81	52	0.041	13-Jan-87	116	0.040
22-Mar-78	8	0.026	15-Jan-82	55	0.039	15-Apr-87	119	0.041
21-Apr-78	9	0.029	15-Apr-82	58	0.040	15-Jul-87	122	0.037
17-May-78	10	0.029	16-Jul-82	61	0.041	15-Oct-87	125	0.040
15-Jun-78	11	0.030	19-Oct-82	64	0.040	15-Jan-88	128	0.043
12-Jul-78	12	0.029	18-Jan-83	67	0.038	15-Apr-88	131	0.046
11-Aug-78	13	0.030	15-Apr-83	70	0.041	19-Jul-88	134	0.048
08-Sep-78	14	0.031	15-Jul-83	73	0.037	18-Oct-88	137	0.048
06-Oct-78	15	0.033	21-Oct-83	76	0.039	12-Jan-89	140	0.050
04-Jan-80	30	0.033	17-Jan-84	79	0.038	12-Jul-89	146	0.049
31-Jan-80	31	0.033	13-Apr-84	82	0.040	12-Jan-90	152	0.049
05-Mar-80	32	0.034	17-Jul-84	85	0.040			
28-Mar-80	33	0.034	16-Oct-84	88	0.036			



ASTM C 227

TEST DATA

Mix No. - 12634



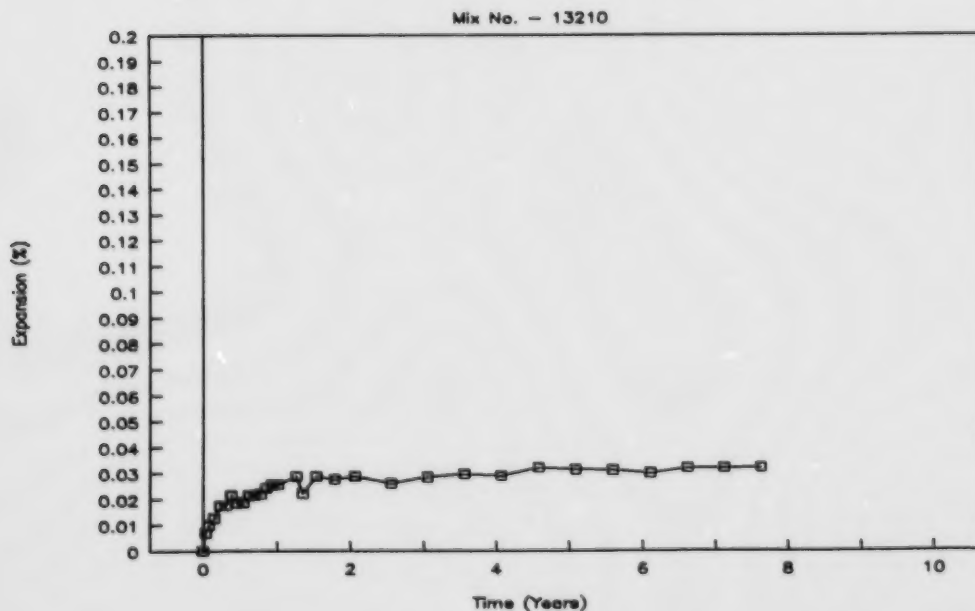
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13210 Aggregate: S-7312, S-7313 & S-7314 TRT CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 01-Apr-82
Age (as of Jan 1/90) : 8 years
Remarks : Specimens stored in Pail 15

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Apr-82	0.0	0.000	05-Oct-84	31	0.026
15-Apr-82	0.4	0.007	04-Apr-85	37	0.028
29-Apr-82	1	0.010	03-Oct-85	43	0.030
27-May-82	2	0.013	04-Apr-86	49	0.029
24-Jun-82	3	0.018	07-Oct-86	55	0.032
22-Jul-82	4	0.018	07-Apr-87	61	0.031
19-Aug-82	5	0.021	07-Oct-87	67	0.031
16-Sep-82	6	0.019	07-Apr-88	73	0.030
14-Oct-82	7	0.019	07-Oct-88	79	0.032
11-Nov-82	7	0.021	07-Apr-89	85	0.032
09-Dec-82	8	0.022	05-Oct-89	91	0.032
06-Jan-83	9	0.022			
03-Feb-83	10	0.024			
03-Mar-83	11	0.025			
31-Mar-83	12	0.026			
30-Jun-83	15	0.029			
29-Jul-83	16	0.022			
05-Oct-83	18	0.029			
04-Jan-84	21	0.028			
10-Apr-84	25	0.029			



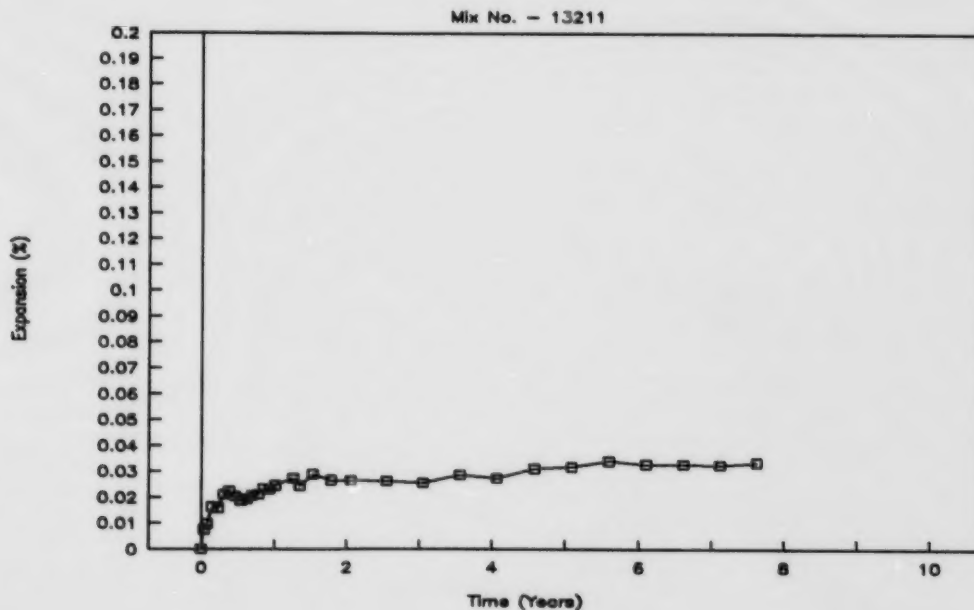
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13211 Aggregate: S-7311 TRT SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 01-Apr-82
Age (as of Jan 1/90) : 8 years
Remarks : Specimens stored in Pail 15

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Apr-82	0.0	0.000	05-Oct-84	31	0.026
15-Apr-82	0.4	0.007	04-Apr-85	37	0.026
29-Apr-82	1	0.010	03-Oct-85	43	0.029
27-May-82	2	0.016	04-Apr-86	49	0.027
24-Jun-82	3	0.016	07-Oct-86	55	0.031
22-Jul-82	4	0.021	07-Apr-87	61	0.032
19-Aug-82	5	0.022	07-Oct-87	67	0.034
16-Sep-82	6	0.020	07-Apr-88	73	0.033
14-Oct-82	7	0.019	07-Oct-88	79	0.033
11-Nov-82	7	0.019	07-Apr-89	85	0.032
09-Dec-82	8	0.021	05-Oct-89	91	0.033
06-Jan-83	9	0.021			
03-Feb-83	10	0.023			
03-Mar-83	11	0.023			
31-Mar-83	12	0.025			
30-Jun-83	15	0.027			
29-Jul-83	16	0.024			
05-Oct-83	18	0.029			
04-Jan-84	21	0.027			
10-Apr-84	25	0.026			



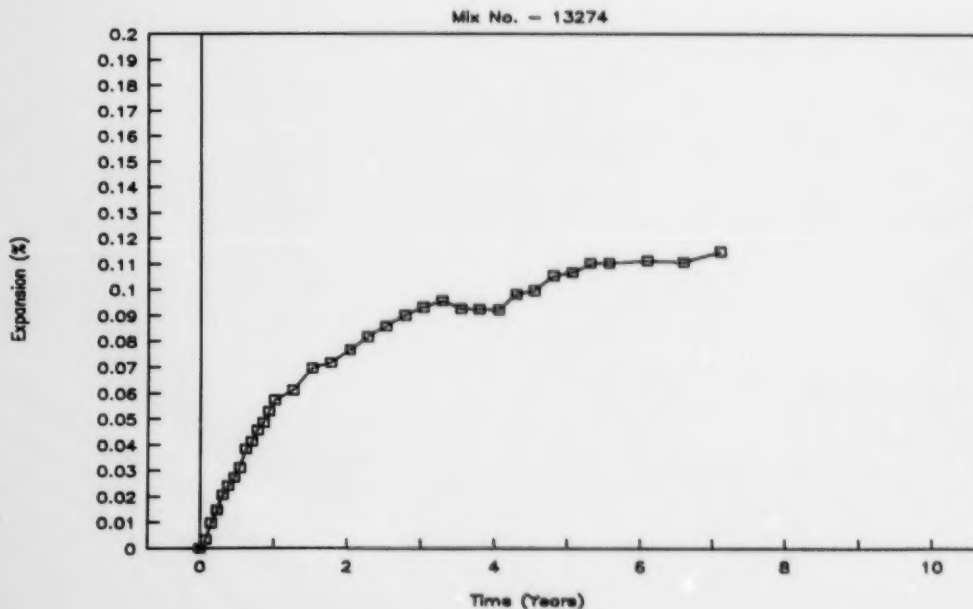
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13274 Aggregate: S-7376 FLEETWOOD SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 10-Feb-83
Age (as of Jan 1/90) : 7 years
Remarks : Specimens stored in Container 215

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-83	0.0	0.000	09-Aug-85	30	0.086
24-Feb-83	0.4	-0.002	08-Nov-85	33	0.090
10-Mar-83	1	0.003	07-Feb-86	36	0.093
07-Apr-83	2	0.010	09-May-86	39	0.096
05-May-83	3	0.015	08-Aug-86	42	0.093
02-Jun-83	4	0.021	07-Nov-86	46	0.093
30-Jun-83	5	0.024	10-Feb-87	49	0.092
28-Jul-83	6	0.027	05-May-87	51	0.098
25-Aug-83	7	0.031	04-Aug-87	55	0.100
23-Sep-83	7	0.038	04-Nov-87	58	0.106
21-Oct-83	8	0.041	05-Feb-88	61	0.107
18-Nov-83	9	0.046	05-May-88	64	0.110
16-Dec-83	10	0.049	05-Aug-88	67	0.110
13-Jan-84	11	0.053	09-Feb-89	73	0.111
10-Feb-84	12	0.057	09-Aug-89	79	0.111
10-May-84	15	0.061	09-Feb-90	85	0.115
10-Aug-84	18	0.070			
09-Nov-84	21	0.072			
13-Feb-85	24	0.077			
10-May-85	27	0.082			



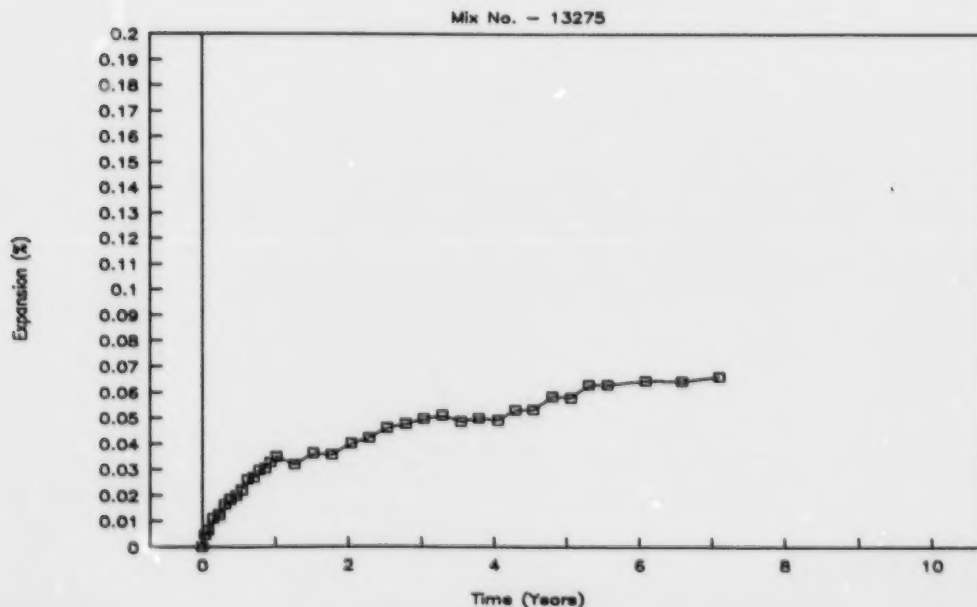
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13275 Aggregate: S-7377 FLEETWOOD CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 10-Feb-83
Age (as of Jan 1/90) : 7 years
Remarks : Specimens stored in Container 216

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-83	0.0	0.000	09-Aug-85	30	0.046
24-Feb-83	0.4	0.005	08-Nov-85	33	0.048
10-Mar-83	1	0.006	07-Feb-86	36	0.050
07-Apr-83	2	0.011	09-May-86	39	0.051
05-May-83	3	0.012	08-Aug-86	42	0.049
02-Jun-83	4	0.016	07-Nov-86	46	0.050
30-Jun-83	5	0.018	10-Feb-87	49	0.049
28-Jul-83	6	0.020	05-May-87	51	0.053
25-Aug-83	7	0.022	04-Aug-87	55	0.053
23-Sep-83	7	0.026	05-Nov-87	58	0.058
21-Oct-83	8	0.027	05-Feb-88	61	0.058
18-Nov-83	9	0.030	05-May-88	64	0.063
16-Dec-83	10	0.030	05-Aug-88	67	0.063
13-Jan-84	11	0.033	09-Feb-89	73	0.064
10-Feb-84	12	0.035	09-Aug-89	79	0.064
10-May-84	15	0.032	09-Feb-90	85	0.066
10-Aug-84	18	0.036			
09-Nov-84	21	0.036			
13-Feb-85	24	0.040			
10-May-85	27	0.042			



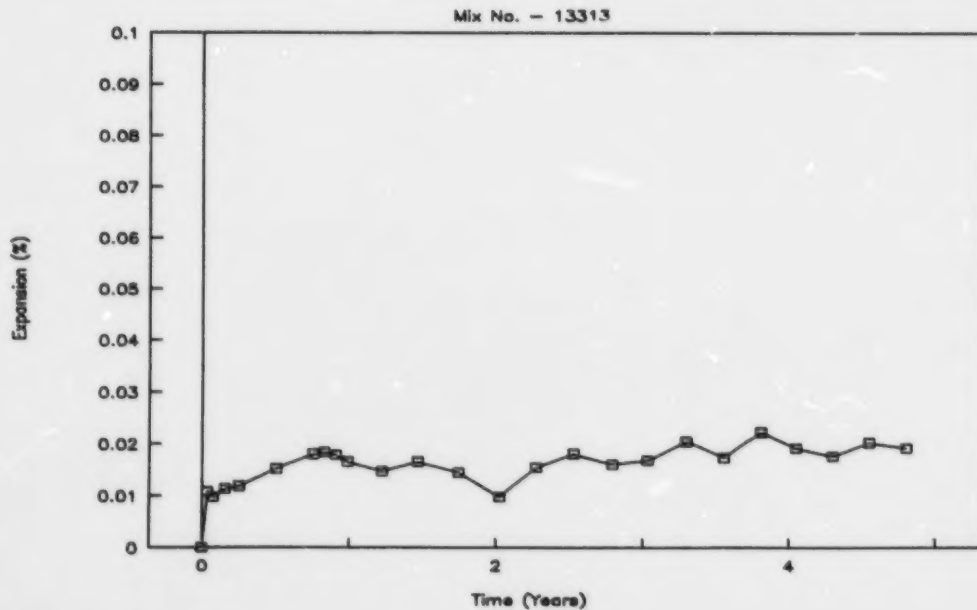
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13313 Aggregate: C-109 SILICA SAND
No. of Specimens : 3 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : LAB. STUDY
Date Cast : 25-May-83
Age (as of Jan 1/90) : 7 years
Remarks : Specimens stored in Pail 13

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-May-83	0.0	0.000	25-Feb-87	46	0.022
08-Jun-83	0.4	0.011	22-May-87	49	0.019
22-Jun-83	1	0.010	21-Aug-87	52	0.018
21-Jul-83	2	0.011	19-Nov-87	55	0.020
24-Aug-83	3	0.012	19-Feb-88	58	0.019
23-Nov-83	6	0.015			
21-Feb-84	9	0.018			
20-Mar-84	10	0.018			
17-Apr-84	11	0.018			
16-May-84	12	0.017			
08-Aug-84	15	0.015			
04-Nov-84	18	0.017			
13-Feb-85	21	0.014			
24-May-85	24	0.010			
23-Aug-85	27	0.015			
22-Nov-85	30	0.018			
25-Feb-86	34	0.016			
23-May-86	36	0.017			
26-Aug-86	40	0.020			
25-Nov-86	43	0.017			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

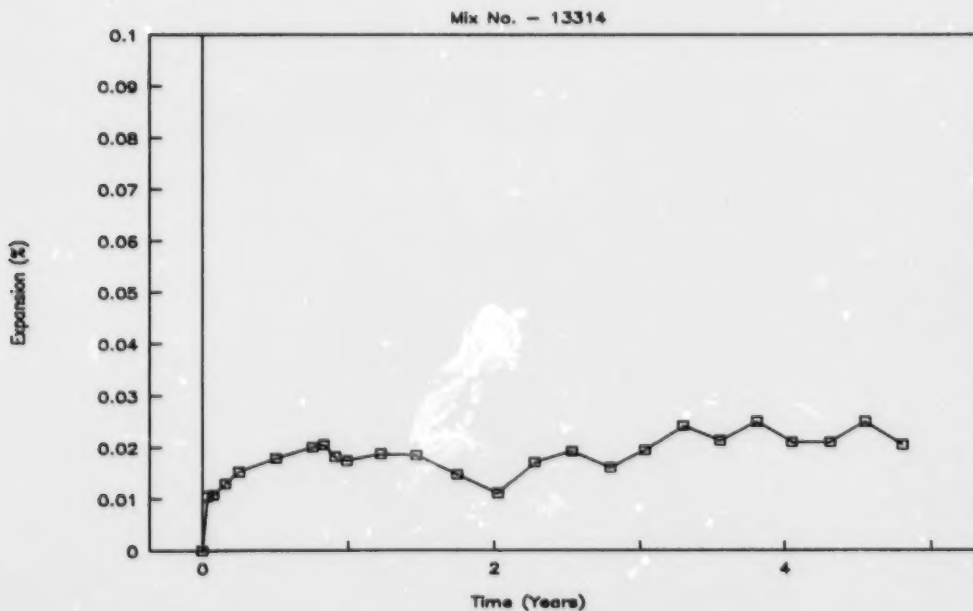
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. :	13314	Aggregate: C-109 SILICA SAND
No. of Specimens :	3	Cement: CL69317 LAB. STD. (ALK 1.17%)
Project :	LAB. STUDY	Fly Ash: 5% CL68358 LAB. STD.
Date Cast :	25-May-83	
Age (as of Jan 1/90) :	7 years	
Remarks :	Specimens stored in Pail 13	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-May-83	0.0	0.000	25-Feb-87	46	0.025
08-Jun-83	0.4	0.010	22-May-87	49	0.021
22-Jun-83	1	0.011	25-Aug-87	52	0.021
21-Jul-83	2	0.013	19-Nov-87	55	0.025
24-Aug-83	3	0.015	19-Feb-88	58	0.020
23-Nov-83	6	0.018			
21-Feb-84	9	0.020			
20-Mar-84	10	0.020			
17-Apr-84	11	0.018			
16-May-84	12	0.017			
08-Aug-84	15	0.019			
04-Nov-84	18	0.018			
13-Feb-85	21	0.015			
24-May-85	24	0.011			
23-Aug-85	27	0.017			
22-Nov-85	30	0.019			
25-Feb-86	34	0.016			
23-May-86	36	0.019			
26-Aug-86	40	0.024			
25-Nov-86	43	0.021			



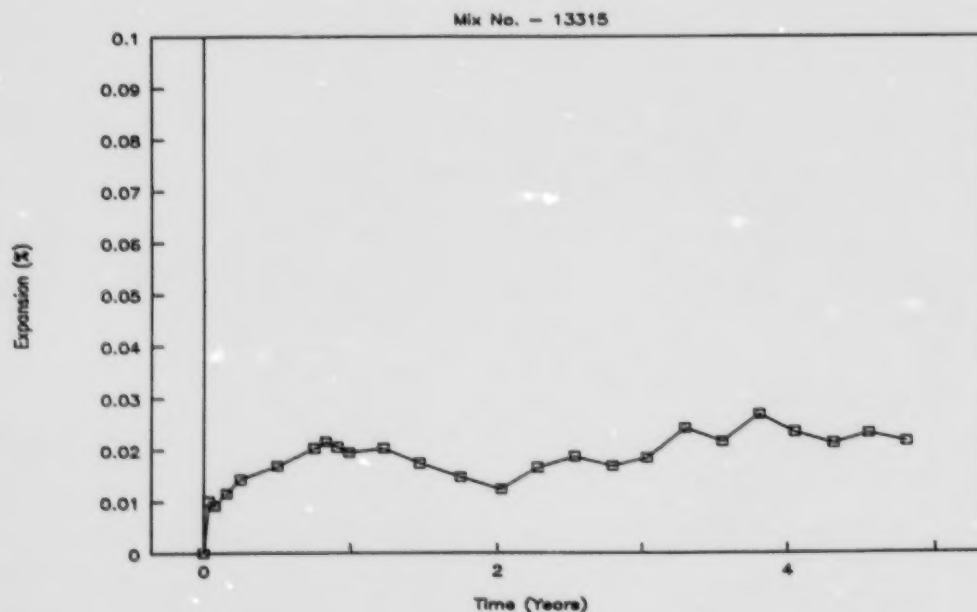
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13315 Aggregate: C-109 SILICA SAND
No. of Specimens : 3 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : LAB. STUDY Fly Ash: 10% CL68358 LAB. STD.
Date Cast : 25-May-83
Age (as of Jan 1/90) : 7 years
Remarks : Specimens stored in Pail 13

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-May-83	0.0	0.000	25-Feb-87	46	0.027
08-Jun-83	0.4	0.010	22-May-87	49	0.023
22-Jun-83	1	0.009	25-Aug-87	52	0.021
21-Jul-83	2	0.012	19-Nov-87	55	0.023
24-Aug-83	3	0.014	19-Feb-88	58	0.022
23-Nov-83	6	0.017			
21-Feb-84	9	0.020			
20-Mar-84	10	0.022			
17-Apr-84	11	0.020			
16-May-84	12	0.019			
08-Aug-84	15	0.020			
04-Nov-84	18	0.017			
13-Feb-85	21	0.015			
24-May-85	24	0.012			
23-Aug-85	27	0.017			
22-Nov-85	30	0.019			
25-Feb-86	34	0.017			
23-May-86	36	0.018			
26-Aug-86	40	0.024			
25-Nov-86	43	0.022			



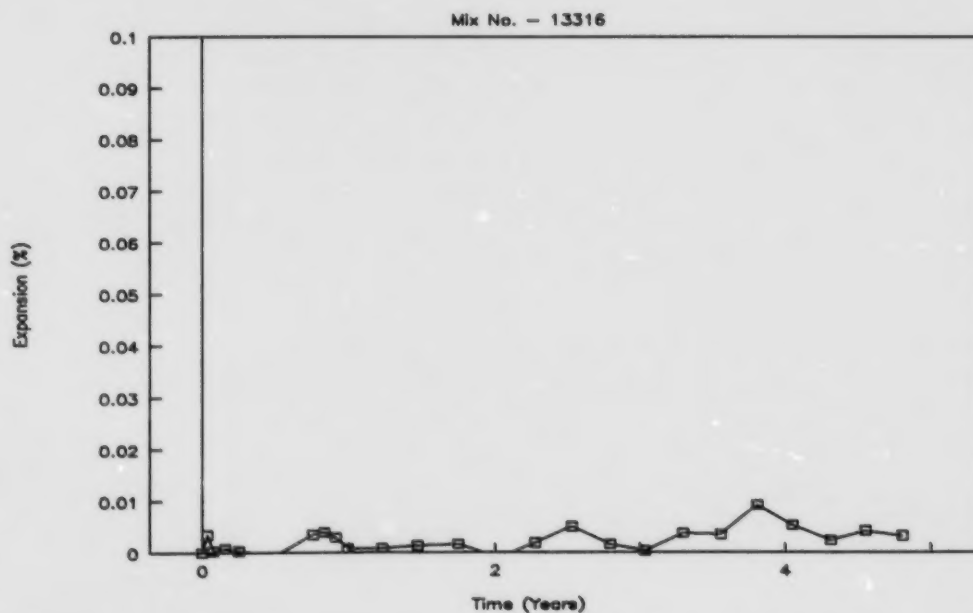
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. :	13316	Aggregate:	C-109 SILICA SAND
No. of Specimens :	3	Cement:	CL69317 LAB. STD. (ALK 1.17%)
Project :	LAB. STUDY	Fly Ash:	25% CL68358 LAB. STD.
Date Cast :	25-May-83		
Age (as of Jan 1/90) :	7 years		
Remarks :	Specimens stored in Pail 13		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-May-83	0.0	0.000	25-Feb-87	46	0.009
08-Jun-83	0.4	0.003	22-May-87	49	0.005
22-Jun-83	1	0.000	25-Aug-87	52	0.002
21-Jul-83	2	0.001	19-Nov-87	55	0.004
24-Aug-83	3	0.000	19-Feb-88	58	0.003
23-Nov-83	6	-0.001			
21-Feb-84	9	0.003			
20-Mar-84	10	0.004			
17-Apr-84	11	0.003			
16-May-84	12	0.001			
08-Aug-84	15	0.001			
04-Nov-84	18	0.001			
13-Feb-85	21	0.002			
24-May-85	24	-0.001			
23-Aug-85	27	0.002			
22-Nov-85	30	0.005			
25-Feb-86	34	0.002			
23-May-86	36	0.000			
26-Aug-86	40	0.004			
26-Nov-86	43	0.003			



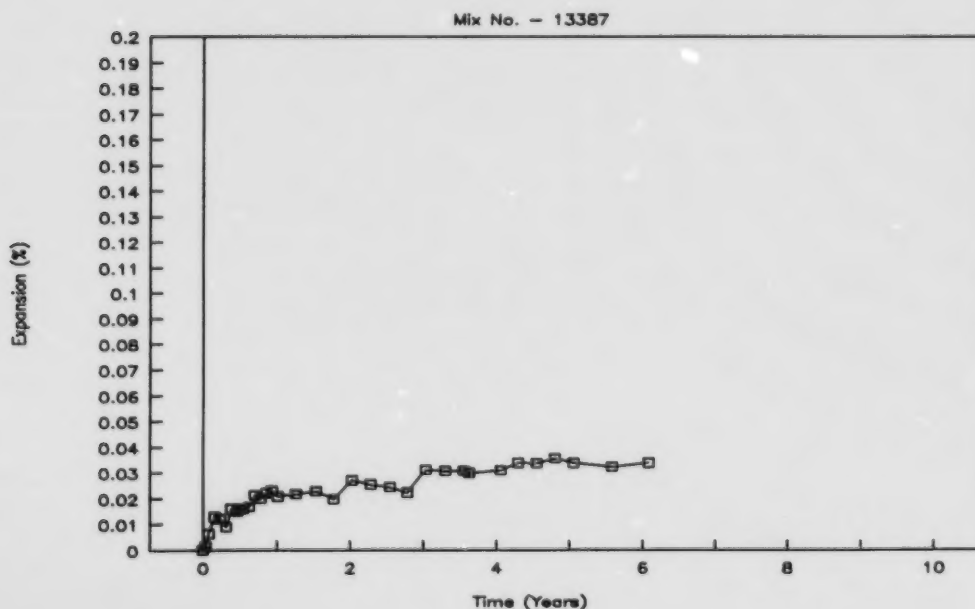
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13387 Aggregate: S-7408 FLEETWOOD SAND
No. of Specimens : 3 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 24-Aug-83
Age (as of Jan 1/90) : 6 years
Remarks : Specimens stored in Pail 17

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Aug-83	0.0	0.000	25-Feb-86	31	0.024
07-Sep-83	0.4	0.001	23-May-86	33	0.022
21-Sep-83	1	0.006	22-Aug-86	36	0.031
21-Oct-83	2	0.013	25-Nov-86	40	0.031
16-Nov-83	3	0.012	24-Feb-87	43	0.031
15-Dec-83	4	0.009	22-Mar-87	44	0.030
11-Jan-84	5	0.016	25-Aug-87	49	0.031
08-Feb-84	6	0.015	19-Nov-87	52	0.034
07-Mar-84	7	0.016	19-Feb-88	55	0.034
06-Apr-84	8	0.017	20-May-88	58	0.036
04-May-84	8	0.021	19-Aug-88	61	0.034
31-May-84	9	0.020	24-Feb-89	67	0.032
28-Jun-84	10	0.022	24-Aug-89	73	0.034
25-Jul-84	11	0.023			
22-Aug-84	12	0.021			
21-Nov-84	15	0.022			
26-Feb-85	18	0.023			
24-May-85	21	0.020			
23-Aug-85	24	0.027			
22-Nov-85	27	0.025			



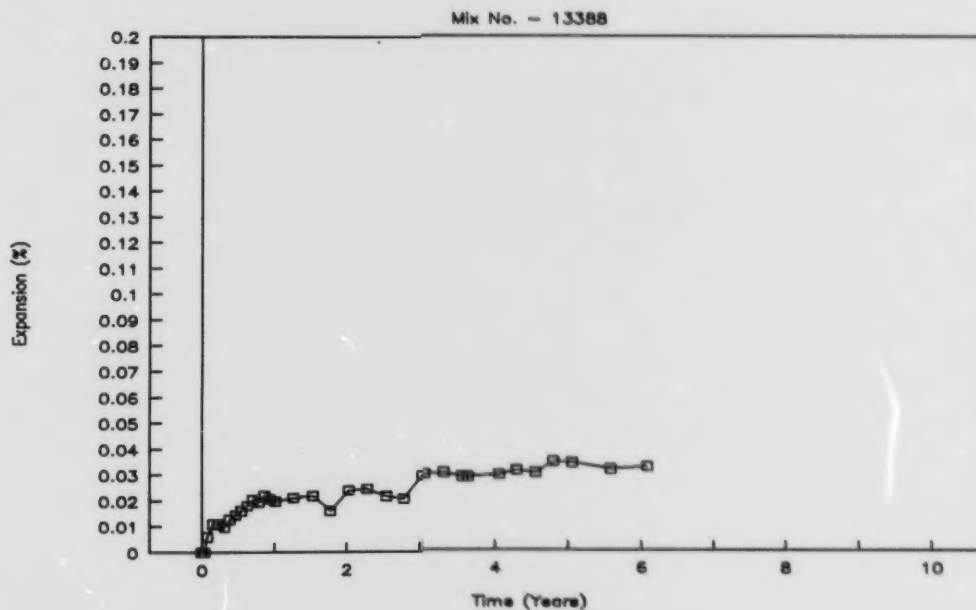
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13388 Aggregate: S-7409 FLEETWOOD CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 24-Aug-83
Age (as of Jan 1/90) : 6 years
Remarks : Specimens stored in Pail 17

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Aug-83	0.0	0.000	25-Feb-86	31	0.022
07-Sep-83	0.4	0.000	23-May-86	33	0.021
21-Sep-83	1	0.006	22-Aug-86	36	0.030
21-Oct-83	2	0.011	25-Nov-86	40	0.030
16-Nov-83	3	0.011	24-Feb-87	43	0.029
15-Dec-83	4	0.010	22-Mar-87	44	0.029
11-Jan-84	5	0.013	25-Aug-87	49	0.029
08-Feb-84	6	0.014	19-Nov-87	52	0.031
07-Mar-84	7	0.016	19-Feb-88	55	0.030
06-Apr-84	8	0.018	20-May-88	58	0.034
04-May-84	8	0.020	19-Aug-88	61	0.034
31-May-84	9	0.019	24-Feb-89	67	0.031
28-Jun-84	10	0.022	24-Aug-89	73	0.032
25-Jul-84	11	0.021			
22-Aug-84	12	0.020			
21-Nov-84	15	0.021			
26-Feb-85	18	0.022			
24-May-85	21	0.016			
23-Aug-85	24	0.024			
22-Nov-85	27	0.024			



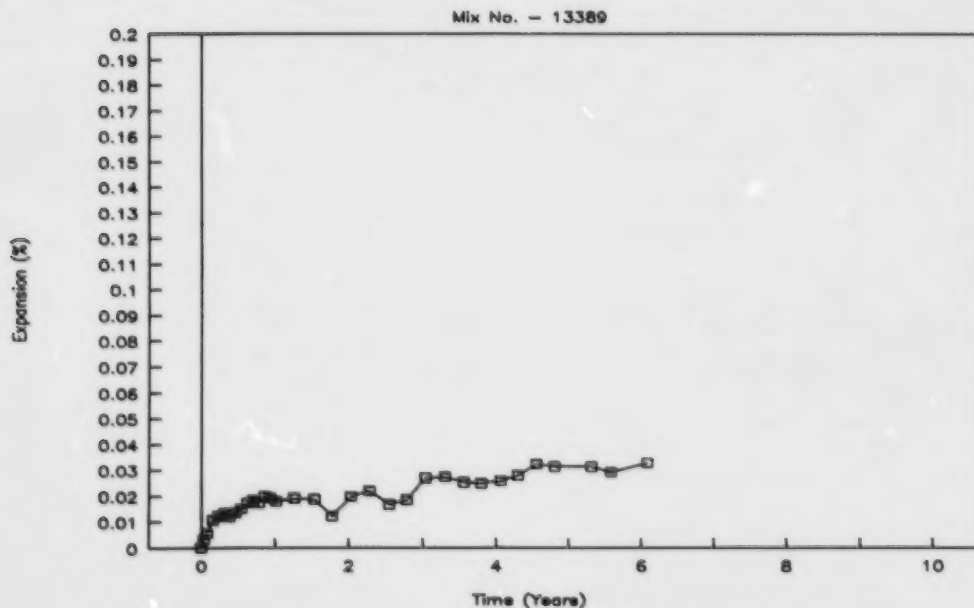
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13389 Aggregate: S-7410 TARA DERBY CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : BRUCE GS "B"
Date Cast : 24-Aug-83
Age (as of Jan 1/90) : 6 years
Remarks : Specimens stored in Pail 17

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Aug-83	0.0	0.000	25-Feb-86	31	0.017
07-Sep-83	0.4	0.003	23-May-86	33	0.019
21-Sep-83	1	0.006	22-Aug-86	36	0.027
21-Oct-83	2	0.011	25-Nov-86	40	0.027
16-Nov-83	3	0.012	24-Feb-87	43	0.025
15-Dec-83	4	0.013	22-May-87	46	0.025
11-Jan-84	5	0.012	25-Aug-87	49	0.026
08-Feb-84	6	0.014	19-Nov-87	52	0.028
07-Mar-84	7	0.015	19-Feb-88	55	0.032
06-Apr-84	8	0.017	20-May-88	58	0.031
04-May-84	8	0.018	19-Nov-88	64	0.031
31-May-84	9	0.017	24-Feb-89	67	0.029
28-Jun-84	10	0.020	24-Aug-89	73	0.033
25-Jul-84	11	0.019			
22-Aug-84	12	0.018			
21-Nov-84	15	0.019			
26-Feb-85	18	0.019			
24-May-85	21	0.012			
23-Aug-85	24	0.020			
22-Nov-85	27	0.022			



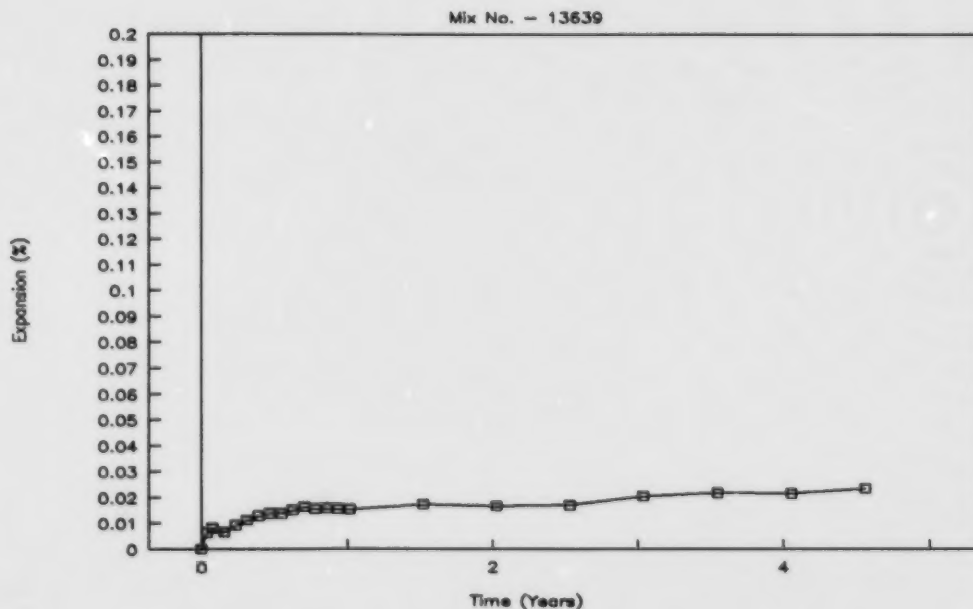
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13639 Aggregate: S-7478 HIGH DENSITY
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 01-Apr-85
Age (as of Jan 1/90) : 4 years
Remarks : Specimens stored in Container 229 and 230

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Apr-85	0.0	0.000	31-Mar-89	49	0.021
16-Apr-85	0.5	0.006	29-Sep-89	55	0.023
29-Apr-85	1	0.008			
28-May-85	2	0.006			
25-Jun-85	3	0.009			
23-Jul-85	4	0.011			
20-Aug-85	5	0.013			
17-Sep-85	6	0.014			
16-Oct-85	7	0.014			
12-Nov-85	7	0.015			
10-Dec-85	8	0.016			
07-Jan-86	9	0.016			
04-Feb-86	10	0.016			
04-Mar-86	11	0.016			
02-Apr-86	12	0.015			
01-Oct-86	18	0.017			
01-Apr-87	24	0.017			
01-Oct-87	30	0.017			
31-Mar-88	36	0.020			
30-Sep-88	43	0.022			



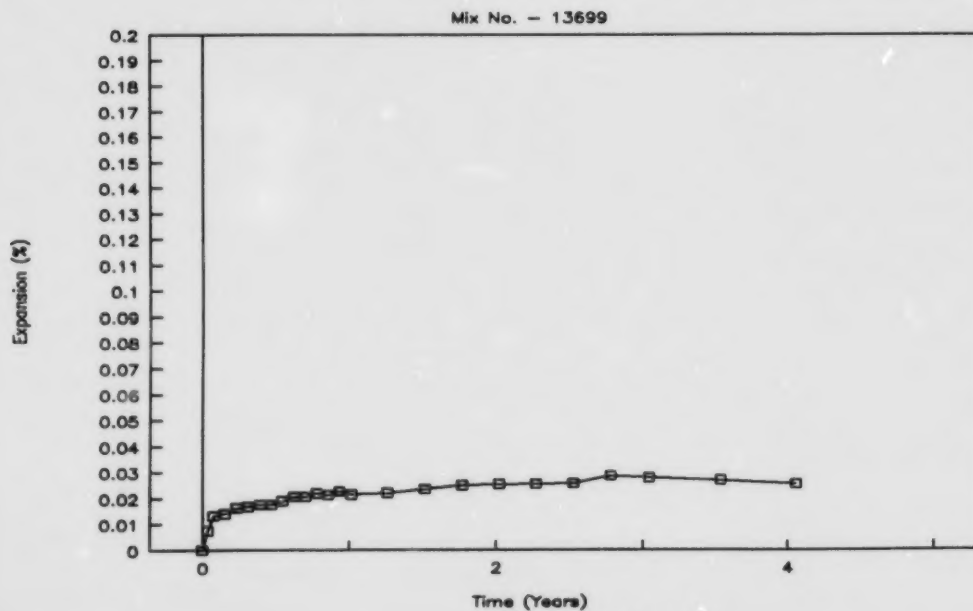
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13699 Aggregate: S-1626 ERAUNHANDS SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : FREDERICK HOUSE
Date Cast : 26-Sep-85
Age (as of Jan 1/90) : 4 years
Remarks : Specimens stored in Pail 22 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
27-Sep-85	0.0	0.000	25-Mar-88	30	0.026
10-Oct-85	0.4	0.007	24-Jun-88	33	0.029
24-Oct-85	1	0.013	27-Sep-88	37	0.028
21-Nov-85	2	0.014	23-Mar-89	42	0.027
19-Dec-85	3	0.016	26-Sep-89	49	0.026
16-Jan-86	4	0.017			
14-Feb-86	5	0.018			
13-Mar-86	6	0.018			
10-Apr-86	7	0.019			
08-May-86	7	0.021			
05-Jun-86	8	0.021			
03-Jul-86	9	0.022			
31-Jul-86	10	0.021			
28-Aug-86	11	0.023			
26-Sep-86	12	0.021			
24-Dec-86	15	0.022			
26-Mar-87	18	0.023			
26-Jun-87	21	0.025			
25-Sep-87	24	0.025			
24-Dec-87	27	0.026			



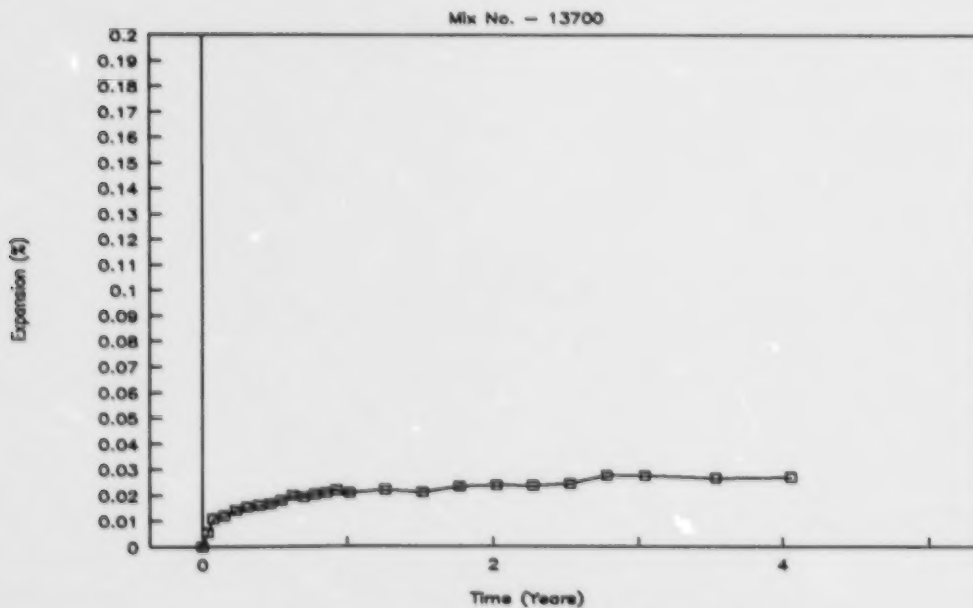
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13700 Aggregate: S-7496 TARA DOWNS CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : BRUCE GS "B"
Date Cast : 26-Sep-85
Age (as of Jan 1/90) : 4 years
Remarks : Specimens stored in Pail 22 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
27-Sep-85	0.0	0.000	25-Mar-88	30	0.024
10-Oct-85	0.4	0.006	24-Jun-88	33	0.028
24-Oct-85	1	0.011	27-Sep-88	37	0.028
21-Nov-85	2	0.012	23-Mar-89	42	0.027
19-Dec-85	3	0.014	26-Sep-89	49	0.027
16-Jan-86	4	0.015			
14-Feb-86	5	0.016			
13-Mar-86	6	0.017			
10-Apr-86	7	0.018			
08-May-86	7	0.020			
05-Jun-86	8	0.019			
03-Jul-86	9	0.020			
31-Jul-86	10	0.021			
26-Aug-86	11	0.022			
26-Sep-86	12	0.021			
24-Dec-86	15	0.022			
26-Mar-87	18	0.021			
26-Jun-87	21	0.023			
25-Sep-87	24	0.024			
24-Dec-87	27	0.024			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

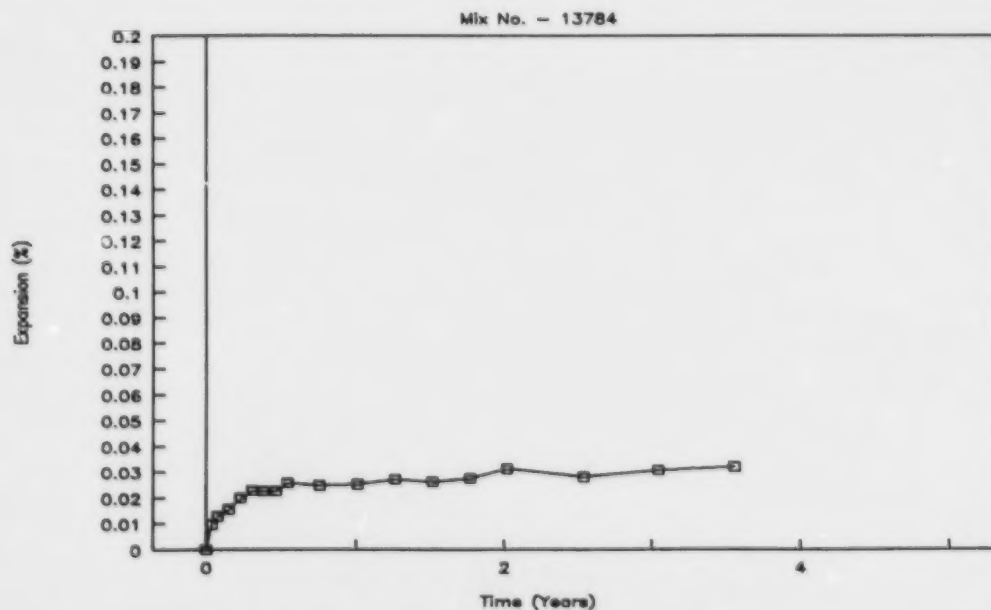
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13784 Aggregate: S-1622 NELLIS LAKE CR GR
 No. of Specimens : 4 Cement: CL 69317 LAB. STD. (ALK 1.17%)
 Project : FREDERICK HOUSE
 Date Cast : 07-Aug-86
 Age (as of Jan 1/90) : 3 years
 Remarks : Specimens stored in Pail 25 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Aug-86	0.0	0.000			
21-Aug-86	0.4	0.010			
04-Sep-86	1	0.013			
02-Oct-86	2	0.016			
30-Oct-86	3	0.020			
27-Nov-86	4	0.023			
24-Dec-86	5	0.023			
22-Jan-87	6	0.023			
19-Feb-87	7	0.026			
07-May-87	9	0.025			
07-Aug-87	12	0.025			
06-Nov-87	15	0.027			
05-Feb-88	18	0.026			
06-May-88	21	0.028			
05-Aug-88	24	0.031			
07-Feb-89	30	0.028			
09-Aug-89	37	0.031			
09-Feb-90	43	0.032			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

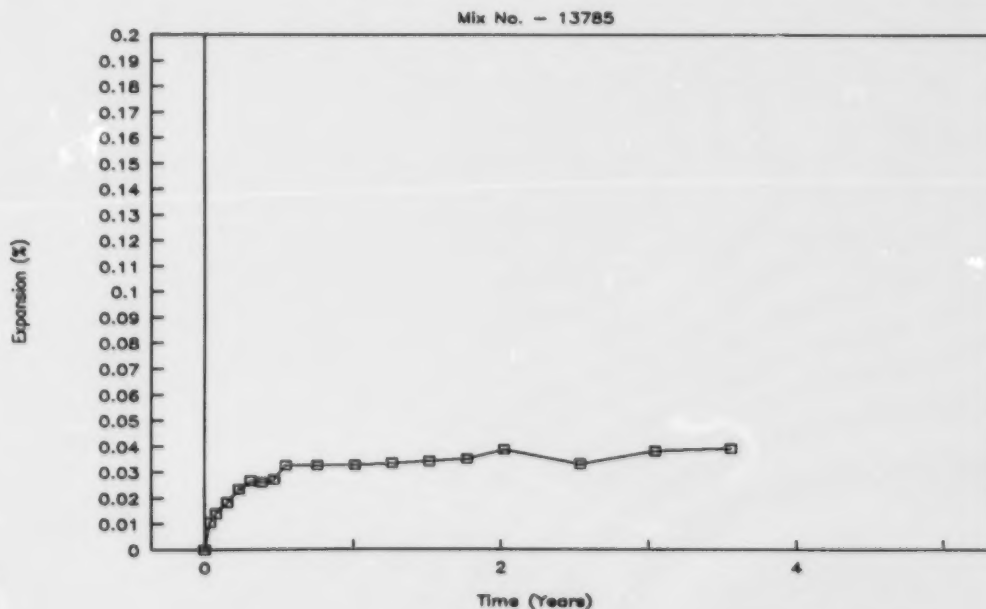
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13785 Aggregate: S-1622 NELLIS LAKE PASS NO4
 No. of Specimens : 4 Cement: CL 69317 LAB. STD. (ALK 1.17%)
 Project : FREDERICK HOUSE
 Date Cast : 07-Aug-86
 Age (as of Jan 1/90) : 3 years
 Remarks : Specimens stored in Pail 25 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Aug-86	0.0	0.000			
21-Aug-86	0.4	0.011			
04-Sep-86	1	0.014			
02-Oct-86	2	0.018			
30-Oct-86	3	0.023			
27-Nov-86	4	0.027			
24-Dec-86	5	0.026			
22-Jan-87	6	0.027			
19-Feb-87	7	0.032			
07-May-87	9	0.032			
07-Aug-87	12	0.032			
06-Nov-87	15	0.033			
05-Feb-88	18	0.034			
06-May-88	21	0.035			
05-Aug-88	24	0.039			
07-Feb-89	30	0.033			
09-Aug-89	37	0.038			
09-Feb-90	43	0.039			

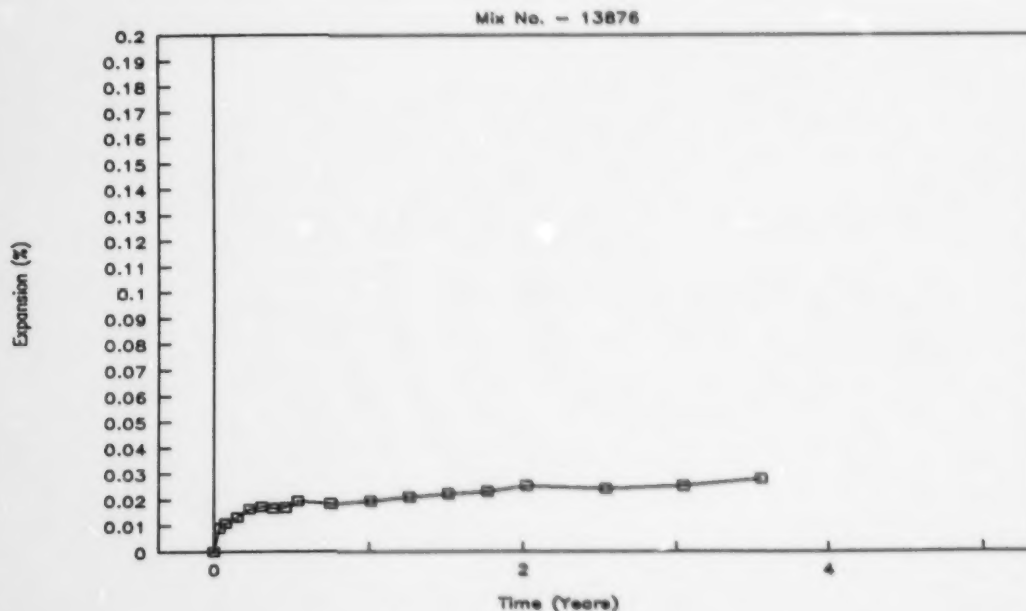


POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 13786 Aggregate: S-6538 LISKEARD CONSTRUCTION CR GR
No. of Specimens : 4 Cement: CL 69317 LAB. STD. (ALK 1.17%)
Project : LADY EVELYN DAM
Date Cast : 07-Aug-86
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Container 247 and 248 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Aug-86	0.0	0.000			
21-Aug-86	0.4	0.009			
04-Sep-86	1	0.011			
02-Oct-86	2	0.013			
30-Oct-86	3	0.016			
27-Nov-86	4	0.017			
24-Dec-86	5	0.017			
22-Jan-87	6	0.017			
19-Feb-87	7	0.019			
07-May-87	9	0.019			
07-Aug-87	12	0.019			
06-Nov-87	15	0.021			
05-Feb-88	18	0.022			
06-May-88	21	0.023			
05-Aug-88	24	0.025			
07-Feb-89	30	0.024			
09-Aug-89	37	0.025			
09-Feb-90	43	0.028			



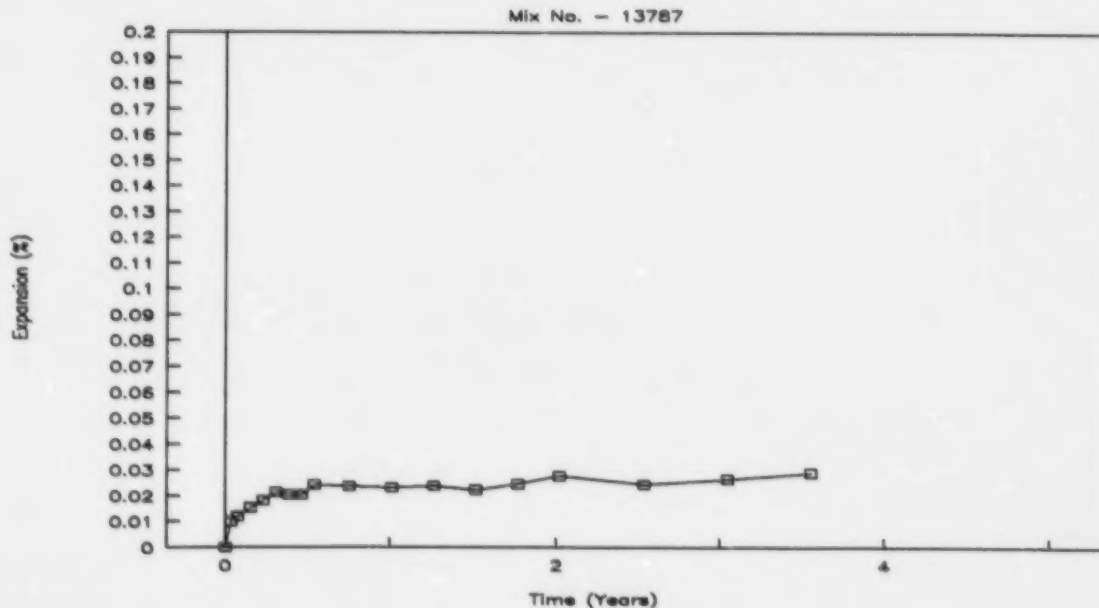
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13787 Aggregate: S-6345 LOWER NOTCH FDT
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : LOWER NOTCH GS
Date Cast : 07-Aug-86
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 25 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Aug-86	0.0	0.000			
21-Aug-86	0.4	0.010			
04-Sep-86	1	0.012			
02-Oct-86	2	0.015			
30-Oct-86	3	0.018			
27-Nov-86	4	0.021			
24-Dec-86	5	0.020			
22-Jan-87	6	0.020			
19-Feb-87	7	0.024			
07-May-87	9	0.023			
07-Aug-87	12	0.023			
06-Nov-87	15	0.024			
05-Feb-88	18	0.022			
06-May-88	21	0.025			
05-Aug-88	24	0.028			
07-Feb-89	30	0.024			
09-Aug-89	37	0.027			
09-Feb-90	43	0.029			



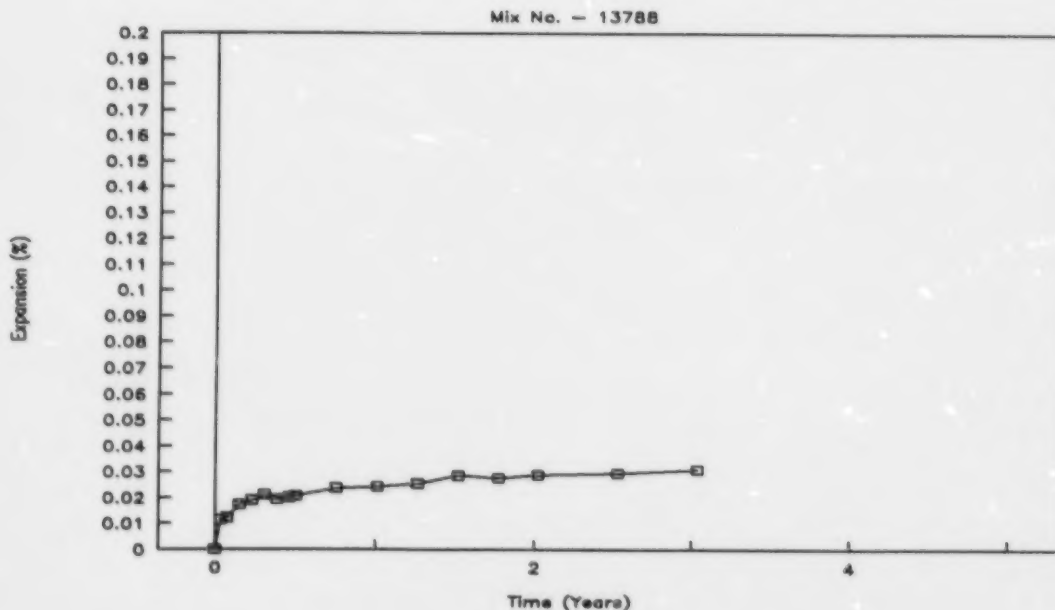
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13788 Aggregate: S-7526 SAUBLE CONCRETE SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : HANMER MISSISSAUGI
Date Cast : 10-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 26 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-87	0.0	0.000			
24-Feb-87	0.4	0.011			
10-Mar-87	1	0.012			
07-Apr-87	2	0.017			
05-May-87	3	0.019			
02-Jun-87	4	0.021			
30-Jun-87	5	0.019			
27-Jul-87	6	0.020			
11-Aug-87	6	0.021			
10-Nov-87	9	0.024			
10-Feb-88	12	0.024			
11-May-88	15	0.025			
11-Aug-88	18	0.029			
11-Nov-88	21	0.028			
09-Feb-89	24	0.029			
10-Aug-89	30	0.030			
09-Feb-90	36	0.031			



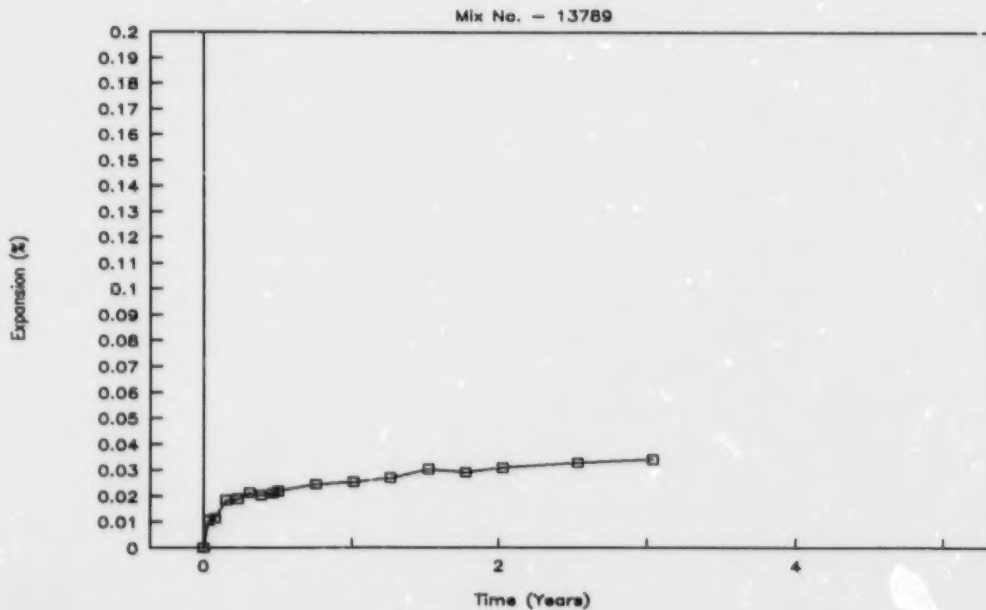
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13789 Aggregate: S-7529 TCG FONTHILL SAND
No. of Specimens : 4 Cement CL69317 LAB. STD. (ALK 1.17%)
Project : NIAGRA REGION
Date Cast : 10-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 26 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-87	0.0	0.000			
24-Feb-87	0.4	0.011			
10-Mar-87	1	0.011			
07-Apr-87	2	0.019			
05-May-87	3	0.019			
02-Jun-87	4	0.021			
30-Jun-87	5	0.020			
28-Jul-87	6	0.021			
11-Aug-87	6	0.022			
10-Nov-87	9	0.024			
10-Feb-88	12	0.025			
11-May-88	15	0.027			
11-Aug-88	18	0.030			
11-Nov-88	21	0.029			
09-Feb-89	24	0.031			
10-Aug-89	30	0.033			
09-Feb-90	36	0.034			



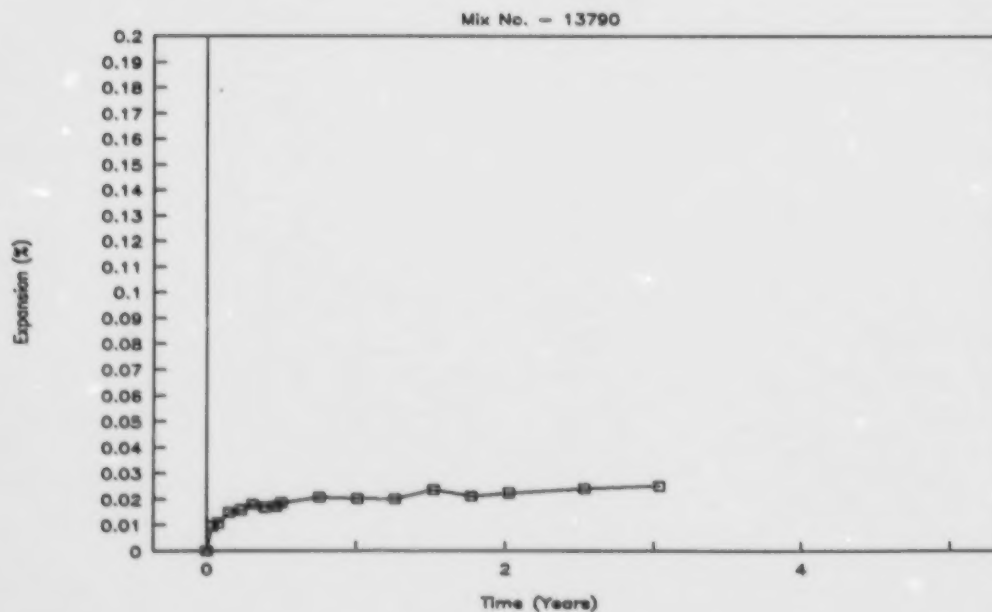
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13790 Aggregate: S-7512 SKEAD CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : HANMER TS
Date Cast : 10-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 27 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-87	0.0	0.000			
24-Feb-87	0.4	0.009			
10-Mar-87	1	0.011			
07-Apr-87	2	0.015			
05-May-87	3	0.016			
02-Jun-87	4	0.018			
30-Jun-87	5	0.017			
28-Jul-87	6	0.017			
11-Aug-87	6	0.019			
10-Nov-87	9	0.021			
10-Feb-88	12	0.020			
11-May-88	15	0.020			
11-Aug-88	18	0.023			
11-Nov-88	21	0.021			
09-Feb-89	24	0.022			
10-Aug-89	30	0.024			
09-Feb-90	36	0.025			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

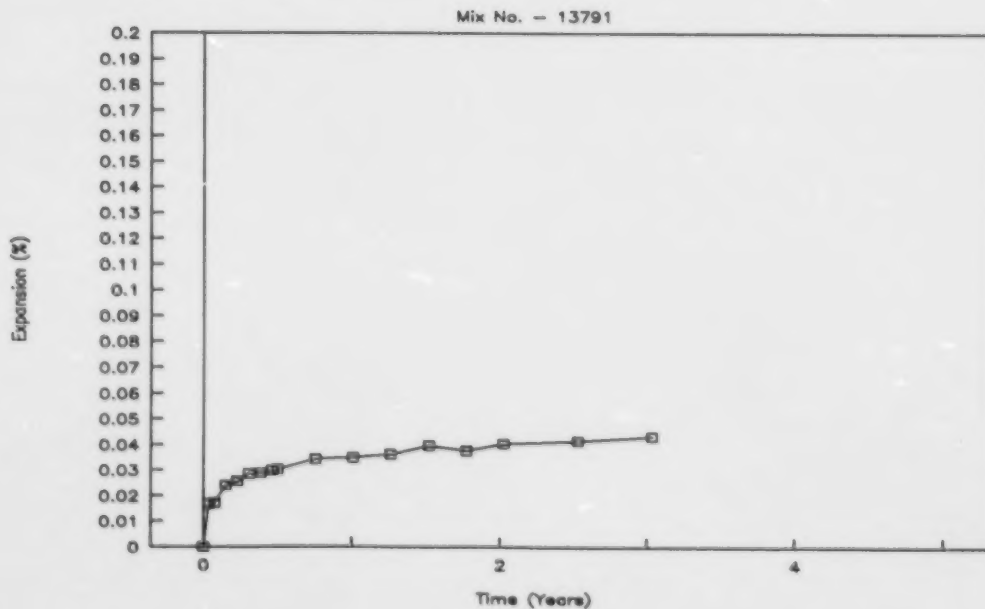
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13791 Aggregate: S-7530 WALKER INDUSTRIES CR ST
 No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
 Project : NIAGRA REGION
 Date Cast : 10-Feb-87
 Age (as of Jan 1/90) : 3 years
 Remarks : Specimens stored in Pail 26 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-87	0.0	0.000			
24-Feb-87	0.4	0.017			
10-Mar-87	1	0.017			
07-Apr-87	2	0.024			
05-May-87	3	0.026			
02-Jun-87	4	0.028			
30-Jun-87	5	0.029			
28-Jul-87	6	0.030			
11-Aug-87	6	0.030			
10-Nov-87	9	0.034			
10-Feb-88	12	0.035			
11-May-88	15	0.036			
11-Aug-88	18	0.039			
11-Nov-88	21	0.037			
09-Feb-89	24	0.040			
10-Aug-89	30	0.041			
09-Feb-90	36	0.043			



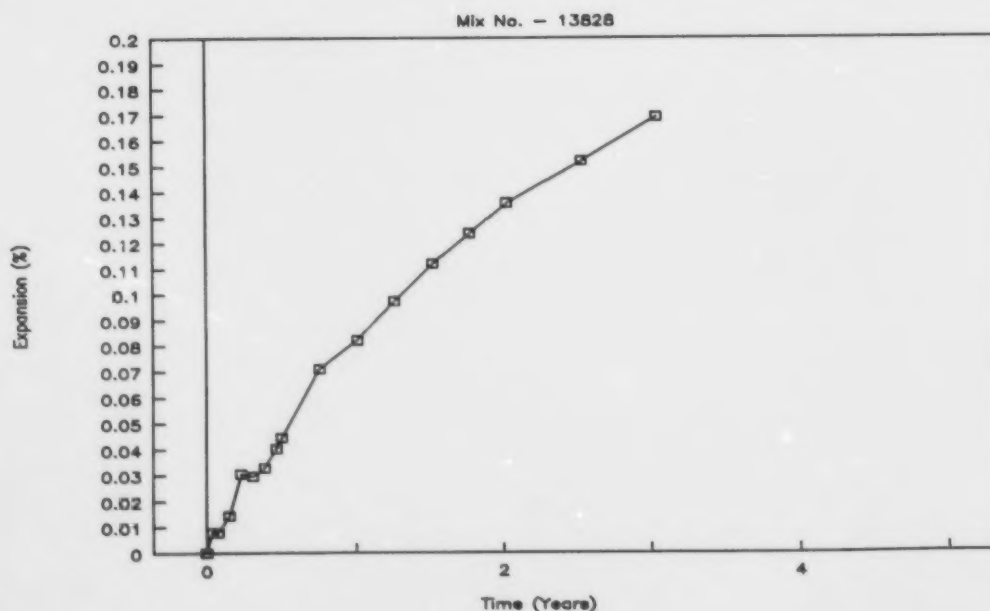
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13828 Aggregate: S-6345 LOWER NOTCH STOCKPILE FDT
No. of Specimens : 4 Cement CL69317 LAB. STD. (ALK 1.17%)
Project : LOWER NOTCH GS
Date Cast : 10-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Container 249 (without wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Feb-87	0.0	0.000			
24-Feb-87	0.4	0.008			
10-Mar-87	1	0.008			
07-Apr-87	2	0.014			
05-May-87	3	0.031			
02-Jun-87	4	0.030			
30-Jun-87	5	0.033			
28-Jul-87	6	0.040			
11-Aug-87	6	0.044			
10-Nov-87	9	0.071			
10-Feb-88	12	0.082			
11-May-88	15	0.097			
11-Aug-88	18	0.112			
11-Nov-88	21	0.124			
09-Feb-89	24	0.136			
10-Aug-89	30	0.152			
09-Feb-90	36	0.169			

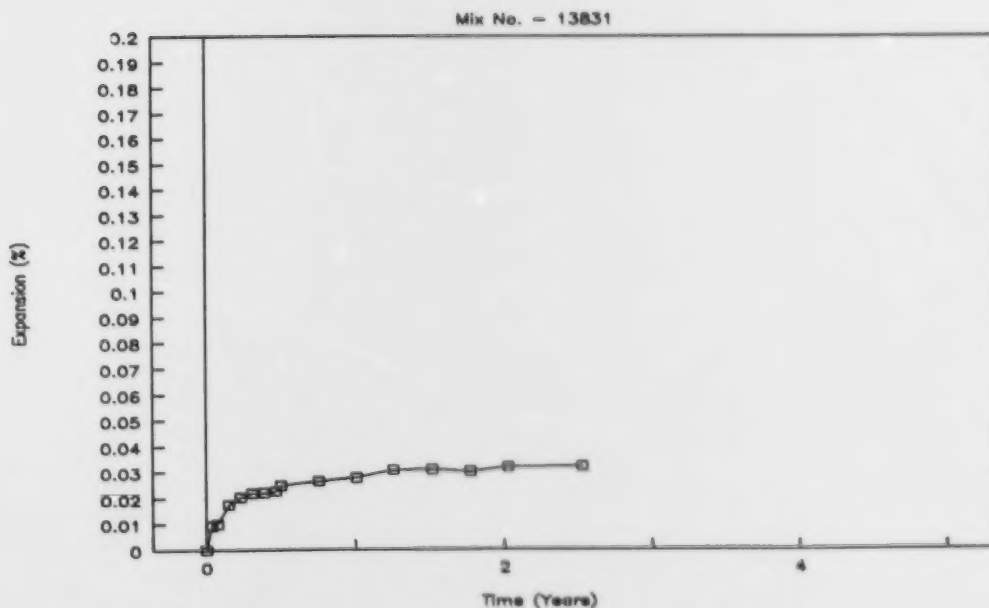


POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 13831 Aggregate: S-7555 FLEETWOOD SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 17-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 28 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
18-Feb-87	0.0	0.000			
03-Mar-87	0.4	0.009			
17-Mar-87	1	0.010			
14-Apr-87	2	0.018			
12-May-87	3	0.020			
09-Jun-87	4	0.022			
07-Jul-87	5	0.022			
04-Aug-87	6	0.023			
18-Aug-87	6	0.025			
17-Nov-87	9	0.026			
17-Feb-88	12	0.028			
18-May-88	15	0.031			
17-Aug-88	18	0.031			
17-Nov-88	21	0.030			
17-Feb-89	24	0.032			
17-Aug-89	30	0.032			



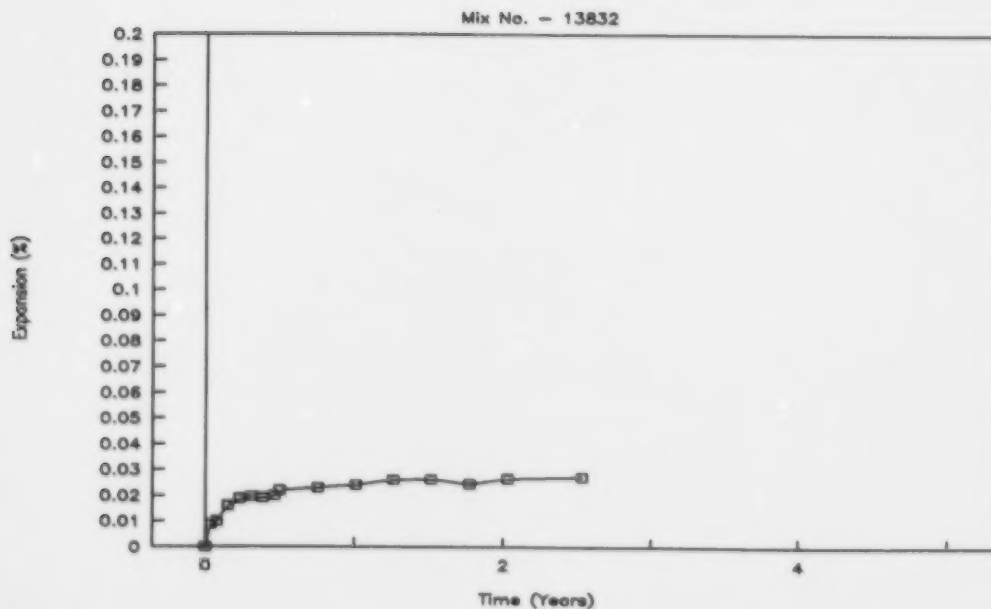
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13832 Aggregate: S-7556 FLEETWOOD CR GR
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : DARLINGTON GS
Date Cast : 17-Feb-87
Age (as of Jan 1/90) : 3 years
Remarks : Specimens stored in Pail 28 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
18-Feb-87	0.0	0.000			
03-Mar-87	0.4	0.009			
17-Mar-87	1	0.010			
14-Apr-87	2	0.016			
12-May-87	3	0.019			
09-Jun-87	4	0.019			
07-Jul-87	5	0.019			
04-Aug-87	6	0.020			
18-Aug-87	6	0.022			
17-Nov-87	9	0.023			
17-Feb-88	12	0.024			
18-May-88	15	0.026			
17-Aug-88	18	0.026			
17-Nov-88	21	0.024			
17-Feb-89	24	0.027			
17-Aug-89	30	0.027			



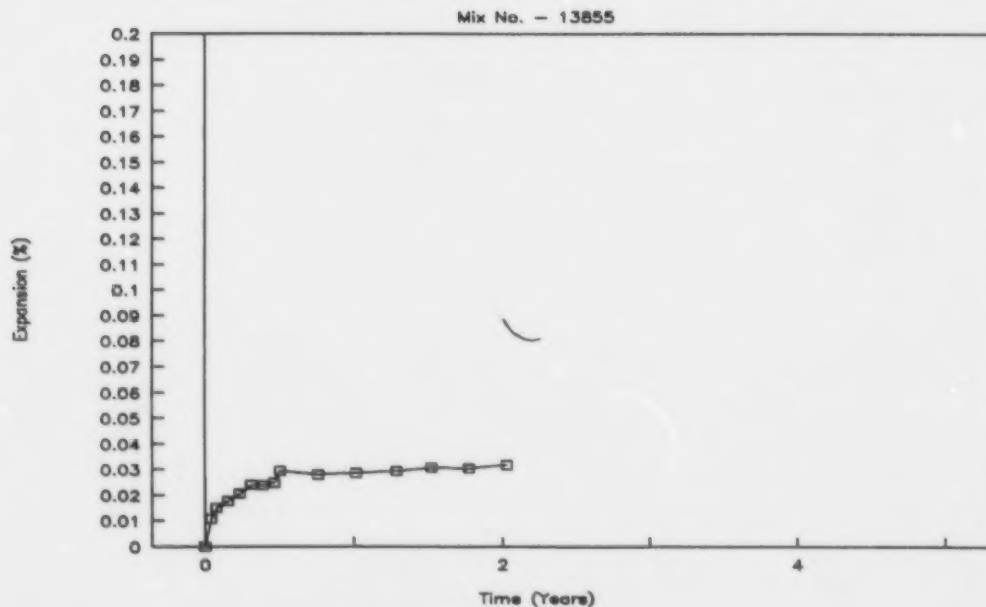
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13855 Aggregate: S-7570 GEORGE TACKABERRY CR ST
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : OTTAWA-LENNOX TL
Date Cast : 28-Sep-87
Age (as of Jan 1/90) : 2 years
Remarks : Specimens stored in Pail 29 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Sep-87	0.0	0.000			
14-Oct-87	0.5	0.011			
27-Oct-87	1	0.015			
24-Nov-87	2	0.018			
22-Dec-87	3	0.021			
19-Jan-88	4	0.024			
16-Feb-88	5	0.024			
15-Mar-88	6	0.025			
29-Mar-88	6	0.029			
28-Jun-88	9	0.028			
28-Sep-88	12	0.029			
04-Jan-89	15	0.029			
29-Mar-89	18	0.031			
28-Jun-89	21	0.031			
28-Sep-89	24	0.032			



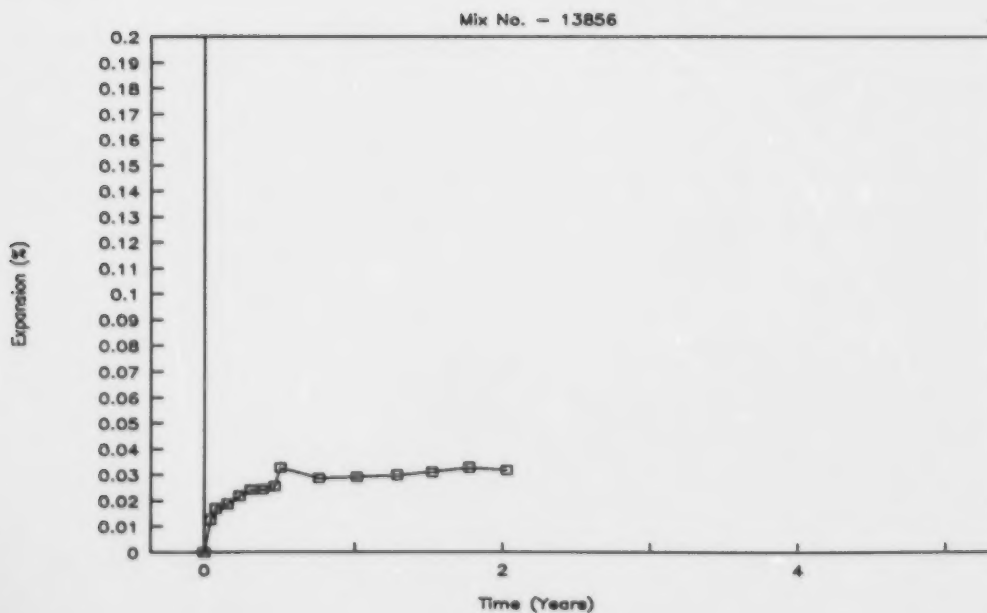
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13856 Aggregate: S-7571 BURNSIDE SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : OTTAWA-HAWTHORN TS
Date Cast : 28-Sep-87
Age (as of Jan 1/90) : 2 years
Remarks : Specimens stored in Pail 29 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Sep-87	0.0	0.000			
14-Oct-87	0.5	0.013			
27-Oct-87	1	0.017			
24-Nov-87	2	0.019			
22-Dec-87	3	0.022			
19-Jan-88	4	0.024			
16-Feb-88	5	0.024			
15-Mar-88	6	0.026			
29-Mar-88	6	0.033			
28-Jun-88	9	0.029			
28-Sep-88	12	0.029			
04-Jan-89	15	0.030			
29-Mar-89	18	0.031			
28-Jun-89	21	0.033			
28-Sep-89	24	0.032			



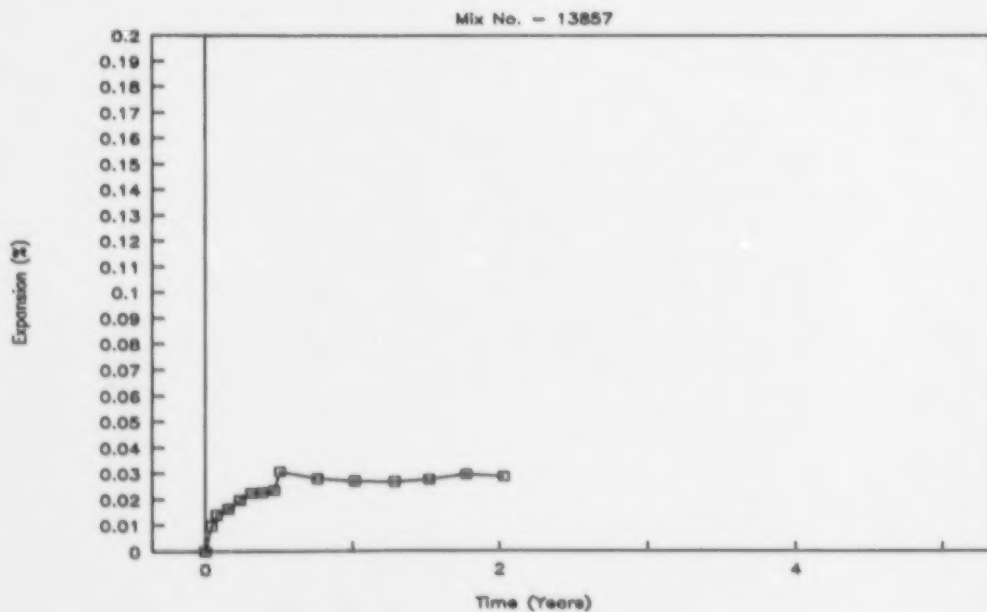
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13857 Aggregate: S-7572 BURNSIDE CR ST
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : OTTAWA-HAWTHORN TS
Date Cast : 28-Sep-87
Age (as of Jan 1/90) : 2 years
Remarks : Specimens stored in Pail 30 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Sep-87	0.0	0.000			
14-Oct-87	0.5	0.010			
27-Oct-87	1	0.014			
24-Nov-87	2	0.016			
22-Dec-87	3	0.020			
19-Jan-88	4	0.022			
16-Feb-88	5	0.023			
15-Mar-88	6	0.023			
29-Mar-88	6	0.031			
28-Jun-88	9	0.028			
28-Sep-88	12	0.027			
04-Jan-89	15	0.027			
29-Mar-89	18	0.028			
28-Jun-89	21	0.030			
28-Sep-89	24	0.029			



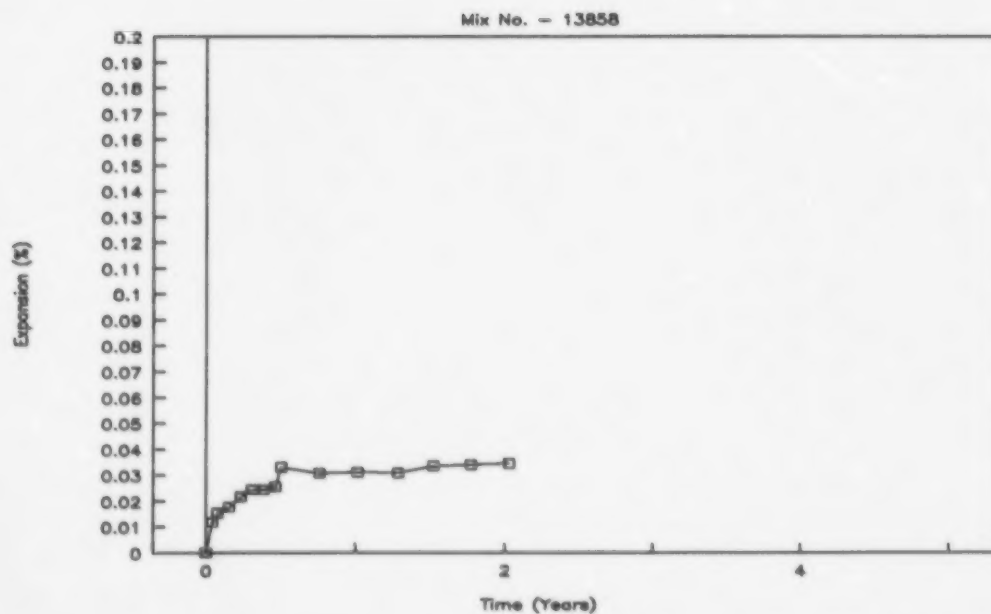
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13858 Aggregate: S-7573 DURHAM SAND
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : EUGENIA FALLS GS
Date Cast : 28-Sep-87
Age (as of Jan 1/90) : 2 years
Remarks : Specimens stored in Pail 30 (with wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
29-Sep-87	0.0	0.000			
14-Oct-87	0.5	0.012			
27-Oct-87	1	0.015			
24-Nov-87	2	0.018			
22-Dec-87	3	0.022			
19-Jan-88	4	0.024			
16-Feb-88	5	0.024			
15-Mar-88	6	0.026			
29-Mar-88	6	0.033			
28-Jun-88	9	0.031			
28-Sep-88	12	0.031			
04-Jan-89	15	0.031			
29-Mar-89	18	0.033			
28-Jun-89	21	0.034			
28-Sep-89	24	0.034			



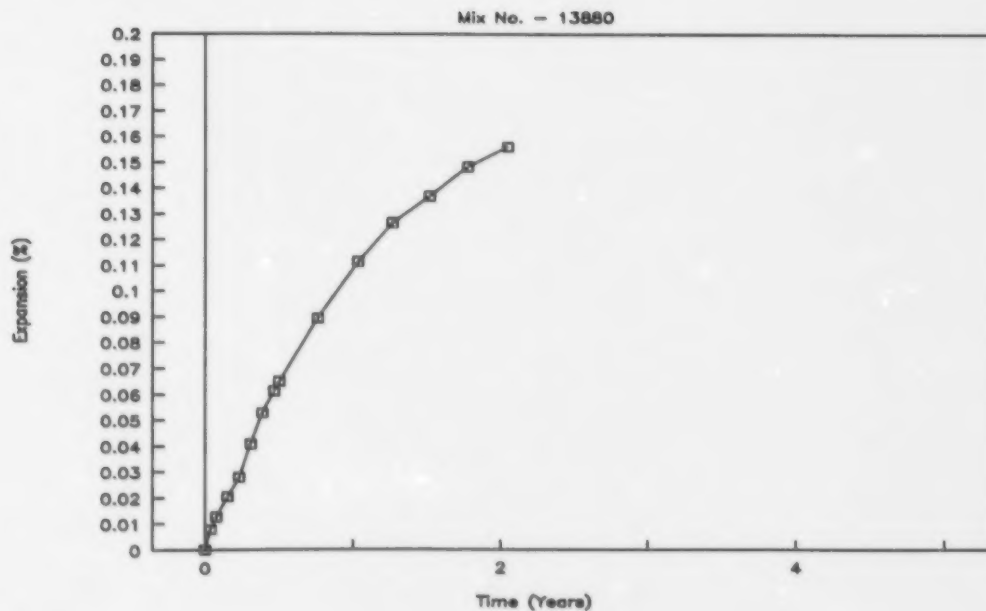
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13880 Aggregate: S-1622 NELLIS LAKE PASS No4
No. of Specimens : 4 Cement: CL69317 LAB. STD. (ALK 1.17%)
Project : AAR CONTAINER EVALUATION
Date Cast : 29-Dec-87
Age (as of Jan 1/90) : 2 years
Remarks : Specimens stored in Container 250 (without wicks)
White spots on specimens (22-Mar-88)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
30-Dec-87	0.0	0.000			
12-Jan-88	0.4	0.008			
26-Jan-88	1	0.013			
23-Feb-88	2	0.020			
22-Mar-88	3	0.028			
19-Apr-88	4	0.041			
17-May-88	5	0.053			
14-Jun-88	6	0.061			
28-Jun-88	6	0.065			
28-Sep-88	9	0.089			
04-Jan-89	12	0.111			
29-Mar-89	15	0.127			
28-Jun-89	18	0.137			
28-Sep-89	21	0.148			
03-Jan-90	25	0.156			



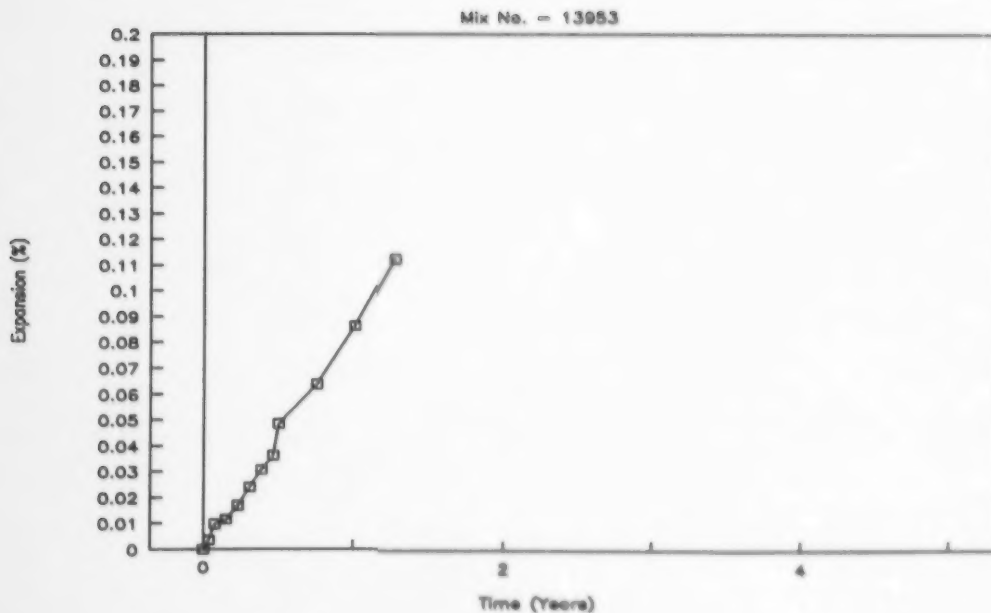
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13953 Aggregate: S-7626 SKEAD DEPOSIT
No. of Specimens : 4 Cement: CL70180 LAB. STD. (ALK 1.00%)
Project : CRYSTAL FALLS GS
Date Cast : 24-Aug-88
Age (as of Jan 1/90) : 1 year
Remarks : Specimens stored in Container 251 (without wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Aug-88	0.0	0.000			
07-Sep-88	0.4	0.004			
21-Sep-88	1	0.010			
19-Oct-88	2	0.012			
16-Nov-88	3	0.017			
14-Dec-88	4	0.024			
11-Jan-89	5	0.031			
08-Feb-89	6	0.036			
22-Feb-89	6	0.049			
24-May-89	9	0.064			
24-Aug-89	12	0.086			
24-Nov-89	15	0.113			



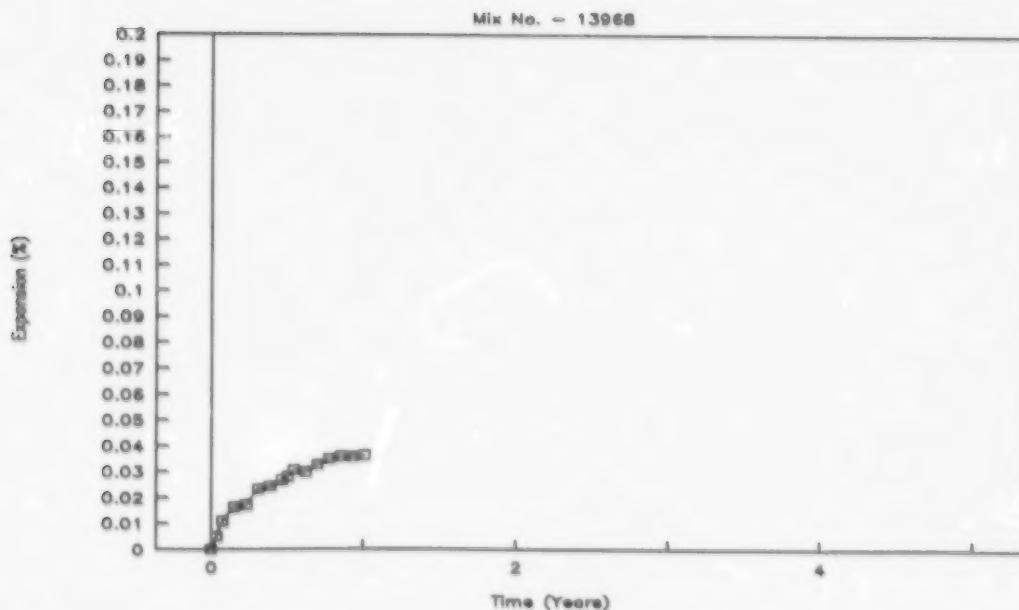
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)

ASTM C 227

Mix No. : 13968 Aggregate: S-7650 ZEALAND PIT, NEW BRUNSWICK SAND
No. of Specimens : 4 Cement: CL70180 LAB. STD. (ALK 1.00%)
Project : CONCRETE DURABILITY
Date Cast : 16-Nov-88
Age (as of Jan 1/90) : 1 year
Remarks : Specimens stored in Container 252 (without wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Nov-88	0.0	0.000			
30-Nov-88	0.4	0.005			
14-Dec-88	1	0.011			
11-Jan-89	2	0.016			
08-Feb-89	3	0.017			
08-Mar-89	4	0.023			
05-Apr-89	5	0.024			
03-May-89	6	0.027			
17-May-89	6	0.028			
31-May-89	7	0.031			
28-Jun-89	7	0.030			
26-Jul-89	8	0.033			
23-Aug-89	9	0.035			
20-Sep-89	10	0.036			
18-Oct-89	11	0.036			
16-Nov-89	12	0.036			

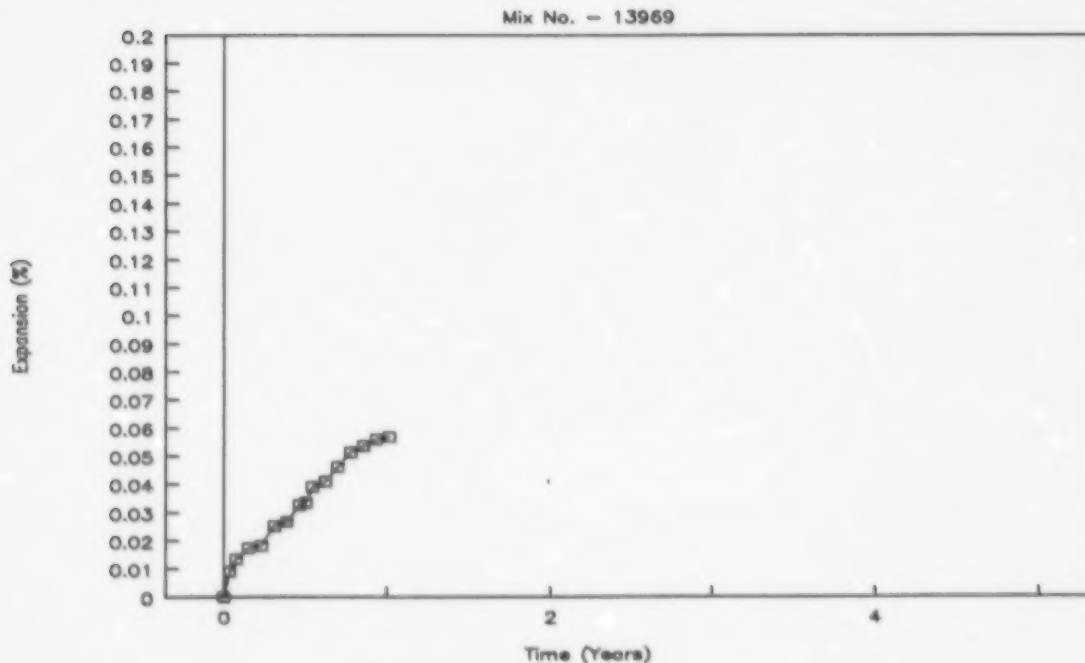


POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(MORTAR-BAR METHOD)
ASTM C 227

Mix No. : 13969 Aggregate: S-7651 MACTAQUAC GS SITE EXCAV
 No. of Specimens : 4 Cement: CL70180 LAB. STD. (ALK 1.00%)
 Project : CONCRETE DURABILITY
 Date Cast : 16-Nov-88
 Age (as of Jan 1/90) : 1 year
 Remarks : Specimens stored in Container 253 (without wicks)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Nov-88	0.0	0.000			
30-Nov-88	0.4	0.009			
14-Dec-88	1	0.013			
11-Jan-89	2	0.017			
08-Feb-89	3	0.018			
08-Mar-89	4	0.025			
05-Apr-89	5	0.027			
03-May-89	6	0.033			
17-May-89	6	0.033			
31-May-89	7	0.039			
28-Jun-89	7	0.041			
26-Jul-89	8	0.046			
23-Aug-89	9	0.051			
20-Sep-89	10	0.054			
18-Oct-89	11	0.056			
16-Nov-89	12	0.057			



APPENDIX B

**POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)**

CSA CAN3-A23.2-14A

LONG-TERM TEST DATA

Specimens stored at 23°C



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

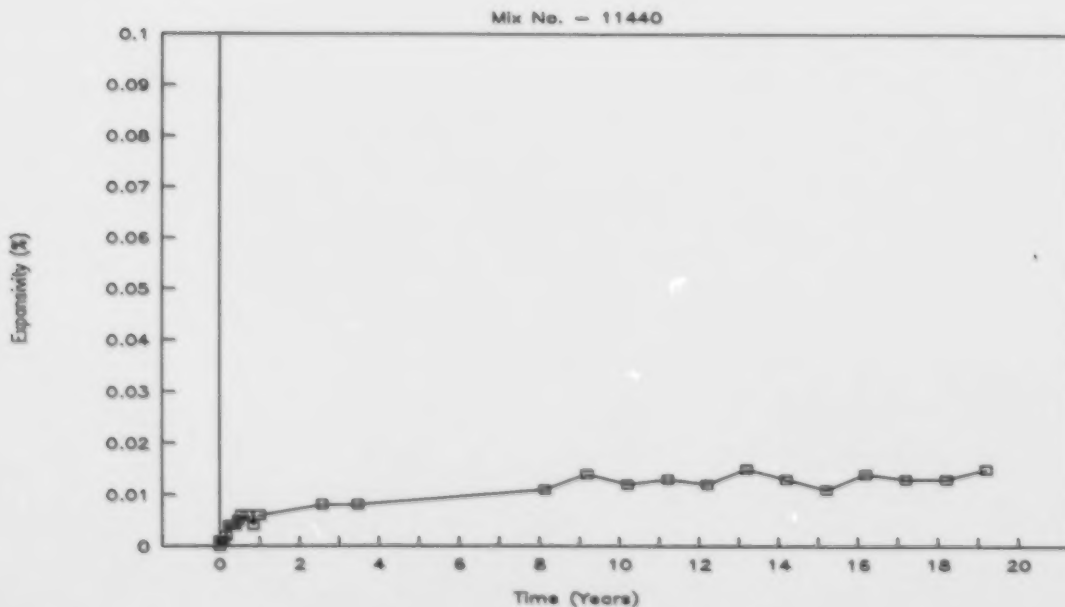
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	11440	Fine Aggregate:	S-6292 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6409 CR RK CORE NO4 3/4"
Project :	LENNOX GS	Cement:	CL62490 LAB. STD. (ALK 0.93%)
Date Cast :	21-Apr-70		
Age (as of Jan 1/90) :	20 years		
Remarks :	Specimens stored at 23 C		
	Not all data reported		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
22-Apr-70	0.0	0.000	28-Jun-79	110	0.014
28-Apr-70	0.0	0.001	30-Jun-80	122	0.012
05-May-70	0.5	0.001	06-Jul-81	135	0.013
19-May-70	1	0.001	29-Jun-82	146	0.012
16-Jun-70	2	0.002	28-Jun-83	158	0.015
14-Jul-70	3	0.004	29-Jun-84	170	0.013
11-Aug-70	4	0.004	02-Jul-85	182	0.011
08-Sep-70	5	0.004	26-Jun-86	194	0.014
06-Oct-70	6	0.005	29-Jun-87	206	0.013
03-Nov-70	6	0.006	29-Jun-88	218	0.013
29-Dec-70	8	0.006	27-Jun-89	230	0.015
23-Feb-71	10	0.004			
21-Apr-71	12	0.006			
15-Nov-72	31	0.008			
10-Oct-73	42	0.008			
08-Jun-78	98	0.011			



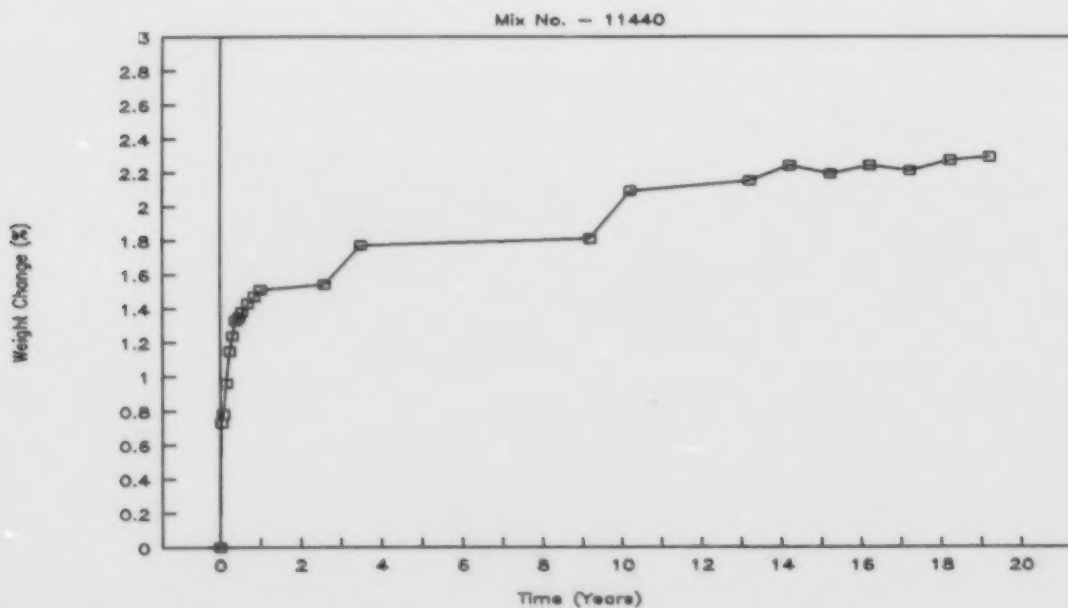
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 11440	Fine Aggregate: S-6929 PARIS SAND
No. of Specimens : 3	Coarse Aggregate: S-6409 CR RK CORE NO4 3/4"
Project : LENNOX GS	Cement: CL62490 LAB. STD. (ALK 0.93%)
Date Cast : 21-Apr-70	
Age (as of Jan 1/90) : 20 years	
Remarks : Specimens stored at 23 C	
Not all data reported	

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
22-Apr-70	0.0	0.000	30-Jun-80	122	2.150
28-Apr-70	0.0	0.730	29-Jun-83	158	2.240
05-May-70	0.5	0.780	29-Jun-84	170	2.190
19-May-70	1	0.960	02-Jul-85	182	2.240
16-Jun-70	2	1.150	26-Jun-86	194	2.210
14-Jul-70	3	1.240	29-Jun-87	206	2.270
11-Aug-70	4	1.330	29-Jun-88	218	2.290
08-Sep-70	5	1.350	27-Jun-89	230	2.270
06-Oct-70	6	1.380			
03-Nov-70	6	1.430			
29-Dec-70	8	1.470			
23-Feb-71	10	1.510			
21-Apr-71	12	1.540			
15-Nov-72	31	1.770			
10-Oct-73	42	1.810			
27-Jun-79	110	2.090			



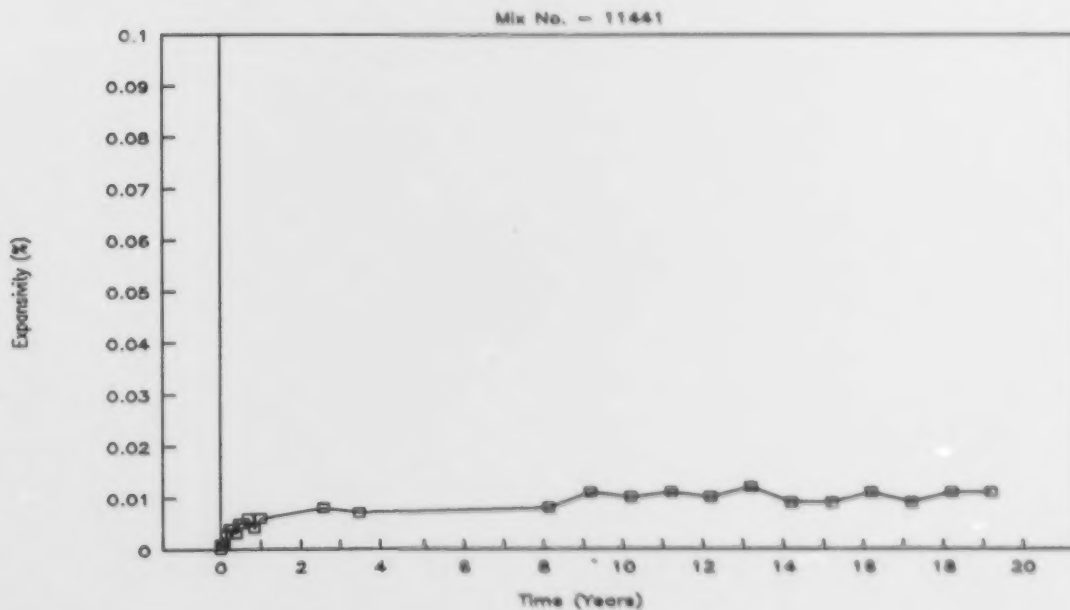
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 11441	Fine Aggregate: S-6292 PARIS SAND
No. of Specimens : 3	Coarse Aggregate: S-5526 DUNDAS CR ST
Project : LENNOX GS	Cement: CL62490 LAB. STD. (ALK 0.93%)
Date Cast : 21-Apr-70	
Age (as of Jan 1/90) : 20 years	
Remarks : Specimens stored at 23 C	
Not all data reported	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
22-Apr-70	0.0	0.000	28-Jun-79	110	0.011
28-Apr-70	0.0	0.001	30-Jun-80	122	0.010
05-May-70	0.5	0.001	06-Jul-81	135	0.011
19-May-70	1	0.001	29-Jun-82	146	0.010
16-Jun-70	2	0.003	29-Jun-83	158	0.012
14-Jul-70	3	0.004	29-Jun-84	170	0.009
11-Aug-70	4	0.004	02-Jul-85	182	0.009
08-Sep-70	5	0.003	26-Jun-86	194	0.011
06-Oct-70	6	0.005	29-Jun-87	206	0.009
03-Nov-70	6	0.005	29-Jun-88	218	0.011
29-Dec-70	8	0.006	27-Jun-89	230	0.011
23-Feb-71	10	0.004			
21-Apr-71	12	0.006			
15-Nov-72	31	0.008			
10-Oct-73	42	0.007			
08-Jun-78	98	0.008			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

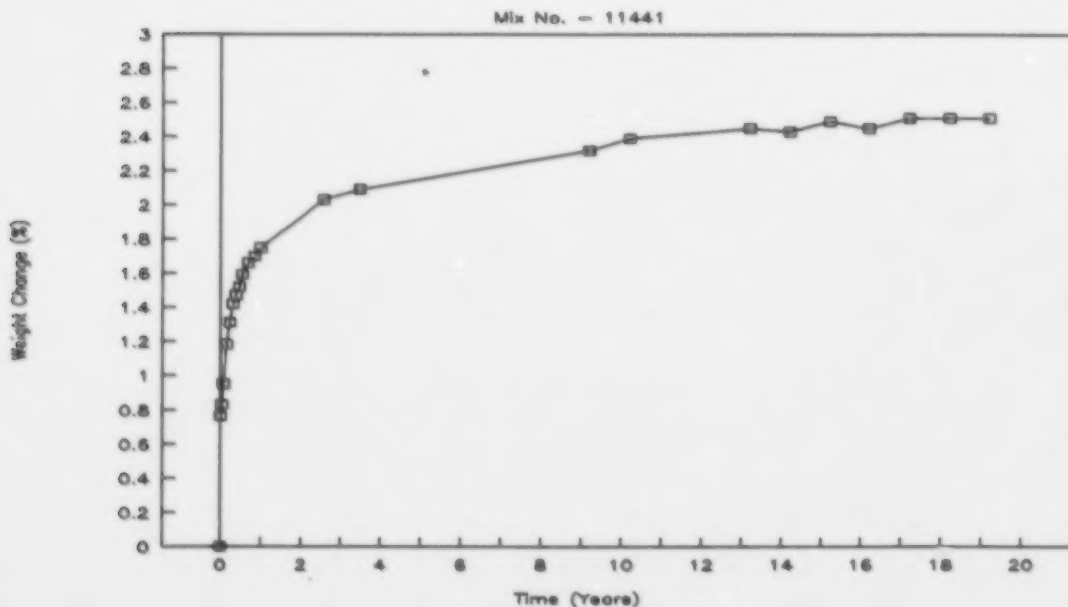
CSA CAN3-A23.2-14A

Mix No. : 11441
No. of Specimens : 3
Project : LENNOX GS
Date Cast : 21-Apr-70
Age (as of Jan 1/90) : 20 years
Remarks : Specimens stored at 23 C
Not all data reported

Fine Aggregate: S-6292 PARIS SAND
Coarse Aggregate: S-5526 DUNDAS CR ST
Cement: CL62490 LAB. STD. (ALK 0.93%)

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
22-Apr-70	0.0	0.000	30-Jun-80	122	2.390
28-Apr-70	0.0	0.760	29-Jun-83	158	2.450
05-May-70	0.5	0.830	29-Jun-84	170	2.430
19-May-70	1	0.950	02-Jul-85	182	2.490
16-Jun-70	2	1.180	26-Jun-86	194	2.450
14-Jul-70	3	1.310	29-Jun-87	206	2.510
11-Aug-70	4	1.420	29-Jun-88	218	2.510
08-Sep-70	5	1.470	27-Jun-89	230	2.510
06-Oct-70	6	1.520			
03-Nov-70	6	1.590			
29-Dec-70	8	1.660			
23-Feb-71	10	1.700			
21-Apr-71	12	1.750			
15-Nov-72	31	2.030			
10-Oct-73	42	2.090			
27-Jun-79	110	2.320			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

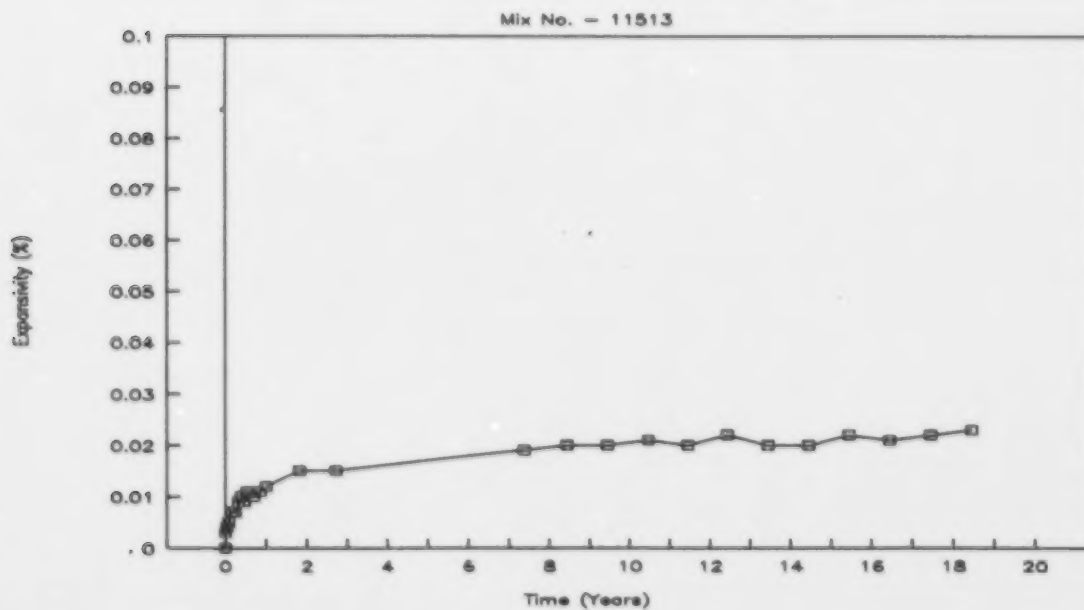
CSA CAN3-A23.2-14A

Mix No. : 11513
No. of Specimens : 3
Project : LENNOX GS
Date Cast : 21-Jan-71
Age (as of Jan 1/90) : 19 years
Remarks : Specimens stored at 23 C
Not all data reported

Fine Aggregate: S-6292 PARIS SAND
Coarse Aggregate: S-6451 MCGUINNES & OCONNER
Cement: CL62490 LAB. STD. (ALK 0.93%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
22-Jan-71	0.0	0.000	28-Jun-79	101	0.020
28-Jan-71	0.0	0.003	30-Jun-80	113	0.020
04-Feb-71	0.5	0.004	06-Jul-81	126	0.021
18-Feb-71	1	0.005	29-Jun-82	137	0.020
18-Mar-71	2	0.007	28-Jun-83	149	0.022
15-Apr-71	3	0.007	29-Jun-84	161	0.020
14-May-71	4	0.009	02-Jul-85	173	0.020
10-Jun-71	5	0.010	26-Jun-86	185	0.022
08-Jul-71	6	0.009	29-Jun-87	197	0.021
05-Aug-71	6	0.011	29-Jun-88	209	0.022
01-Oct-71	8	0.010	27-Jun-89	221	0.023
25-Nov-71	10	0.011			
20-Jan-72	12	0.012			
15-Nov-72	22	0.015			
10-Oct-73	33	0.015			
08-Jun-78	89	0.019			



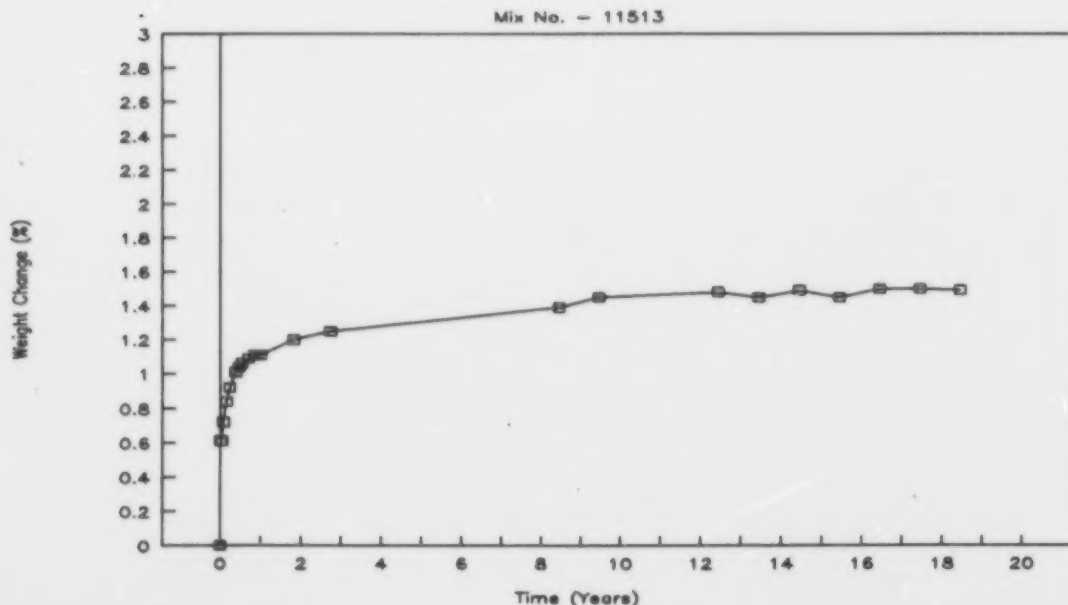
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 11513	Fine Aggregate: S-6292 PARIS SAND
No. of Specimens : 3	Coarse Aggregate: S-6451 MCUINNES & OCONNER
Project : LENNOX GS	Cement: CL62490 LAB. STD. (ALK 0.93%)
Date Cast : 21-Jan-71	
Age (as of Jan 1/90) : 19 years	
Remarks : Specimens stored at 23 C	
Not all data reported	

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
22-Jan-71	0.0	0.000	28-Jun-83	149	1.480
28-Jan-71	0.0	0.610	29-Jun-84	161	1.450
04-Feb-71	0.5	0.610	02-Jul-85	173	1.490
18-Feb-71	1	0.720	26-Jun-86	185	1.450
18-Mar-71	2	0.840	29-Jun-87	197	1.500
15-Apr-71	3	0.920	29-Jun-88	209	1.500
10-Jun-71	5	1.010	27-Jun-89	221	1.490
08-Jul-71	6	1.040			
05-Aug-71	6	1.060			
01-Oct-71	8	1.090			
25-Nov-71	10	1.110			
20-Jan-72	12	1.110			
15-Nov-72	22	1.200			
10-Oct-73	33	1.250			
28-Jun-79	101	1.390			
30-Jun-80	113	1.450			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

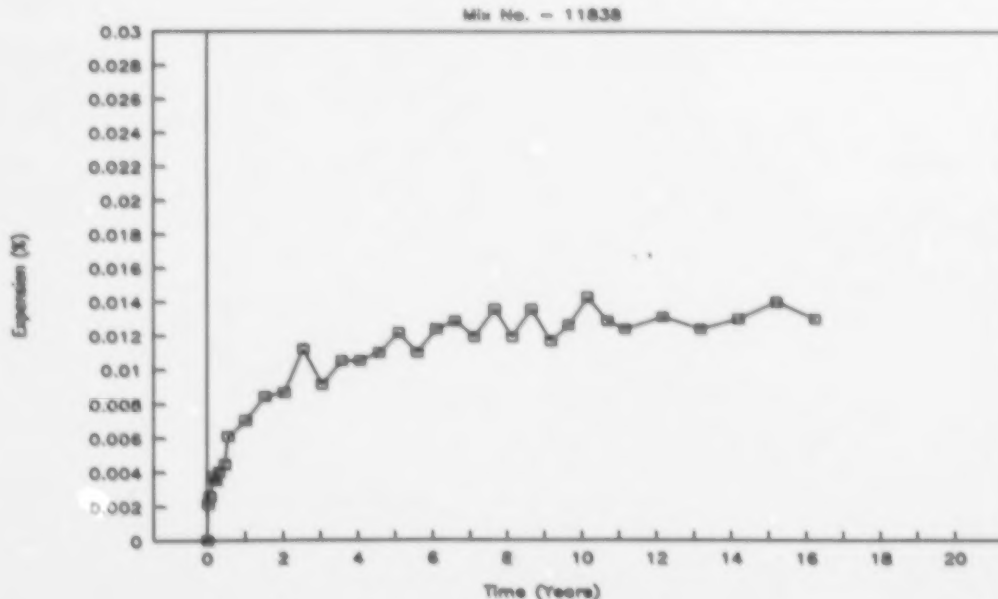
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	11838	Fine Aggregate:	S-6582 DIBBLE SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	ARNPRIOR GS	Cement:	CL66858 (ALK 1.02%)
Date Cast :	18-Jul-73		
Age (as of Jan 1/90) :	16 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
19-Jul-73	0.0	0.000	19-Jan-79	67	0.011
25-Jul-73	0.2	0.002	20-Jul-79	73	0.012
01-Aug-73	0.4	0.002	20-Jan-80	79	0.013
15-Aug-73	1	0.003	22-Jul-80	85	0.012
12-Sep-73	2	0.004	02-Feb-81	92	0.014
10-Oct-73	3	0.004	22-Jul-81	98	0.012
07-Nov-73	4	0.004	26-Jan-82	104	0.014
02-Jan-74	6	0.004	03-Aug-82	110	0.012
04-Feb-74	7	0.006	21-Jan-83	116	0.013
22-Jul-74	12	0.007	21-Jul-83	122	0.014
20-Jan-75	18	0.008	30-Jan-84	128	0.013
21-Jul-75	24	0.009	20-Jul-84	134	0.012
18-Jan-76	30	0.011	19-Jul-85	146	0.013
16-Jul-76	36	0.009	18-Jul-86	158	0.012
20-Jan-77	43	0.011	17-Jul-87	170	0.013
18-Jul-77	49	0.011	18-Jul-88	183	0.014
19-Jan-78	55	0.011	18-Jul-89	195	0.013
26-Jul-78	61	0.012			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

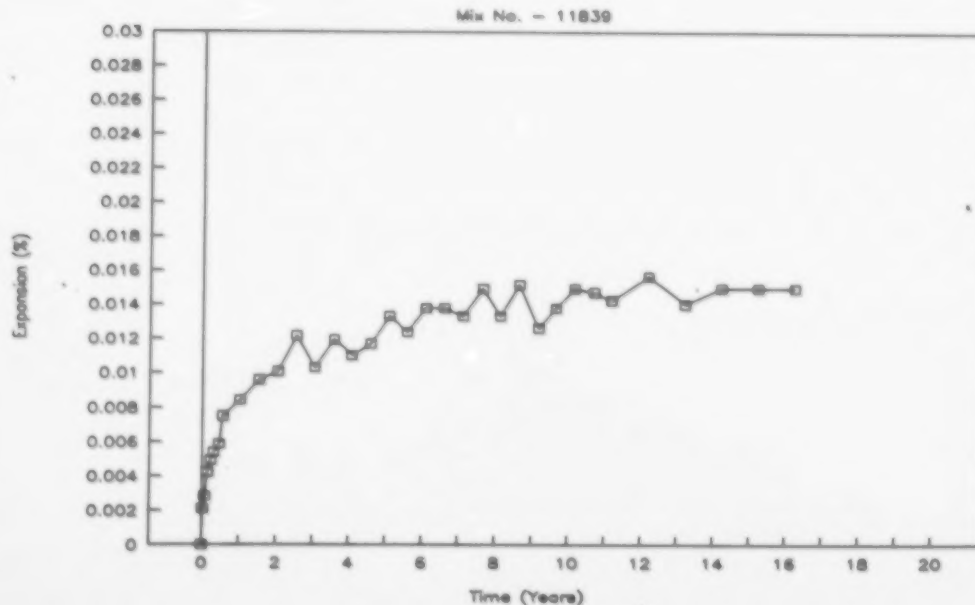
CSA CAN3-A23.2-14A

Mix No. : 11839
No. of Specimens : 3
Project : ARNPRIOR GS
Date Cast : 18-Jul-73
Age (as of Jan 1/90) : 16 years
Remarks : Specimens stored at 23 C

Fine Aggregate: S-6582 DIBBLE SAND
Coarse Aggregate: S-6583 BRAESIDE CR RK
Cement: CL66858 (ALK 1.02%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
19-Jul-73	0.0	0.000	19-Jan-79	67	0.012
25-Jul-73	0.2	0.002	20-Jul-79	73	0.014
01-Aug-73	0.4	0.002	20-Jan-80	79	0.014
15-Aug-73	1	0.003	22-Jul-80	85	0.013
12-Sep-73	2	0.004	02-Feb-81	92	0.015
10-Oct-73	3	0.005	22-Jul-81	98	0.013
07-Nov-73	4	0.005	26-Jan-82	104	0.015
02-Jan-74	6	0.006	03-Aug-82	110	0.013
04-Feb-74	7	0.007	21-Jan-83	116	0.014
22-Jul-74	12	0.008	21-Jul-83	122	0.015
20-Jan-75	18	0.010	30-Jan-84	128	0.015
21-Jul-75	24	0.010	20-Jul-84	134	0.014
18-Jan-76	30	0.012	19-Jul-85	146	0.016
16-Jul-76	36	0.010	18-Jul-86	158	0.014
20-Jan-77	43	0.012	17-Jul-87	170	0.015
18-Jul-77	49	0.011	18-Jul-88	183	0.015
19-Jan-78	55	0.012	18-Jul-89	195	0.015
26-Jul-78	61	0.013			



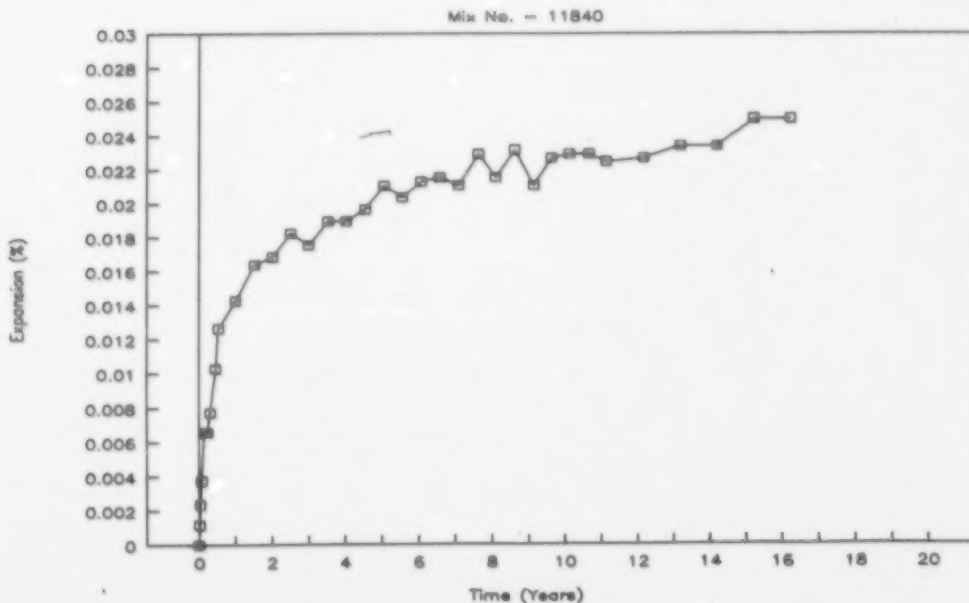
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 11840	Fine Aggregate: S-6582 DIBBLE SAND
No. of Specimens : 3	Coarse Aggregate: S-6566 WABA CREEK
Project : ARNPRIOR GS	Cement: CL66858 (ALK 1.02%)
Date Cast : 24-Jul-73	
Age (as of Jan 1/90) : 16 years	
Remarks : Specimens stored at 23 C	
One specimen developed hairline cracks at one end (26-Jul-78)	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Jul-73	0.0	0.000	19-Jan-79	67	0.020
31-Jul-73	0.2	0.001	20-Jul-79	73	0.021
07-Aug-73	0.4	0.002	20-Jan-80	79	0.022
21-Aug-73	1	0.004	22-Jul-80	85	0.021
18-Sep-73	2	0.007	03-Feb-81	92	0.023
16-Oct-73	3	0.007	22-Jul-81	97	0.022
13-Nov-73	4	0.008	26-Jan-82	104	0.023
08-Jan-74	6	0.010	03-Aug-82	110	0.021
04-Feb-74	6	0.013	21-Jan-83	116	0.023
22-Jul-74	12	0.014	21-Jul-83	122	0.023
25-Jan-75	18	0.016	30-Jan-84	128	0.023
21-Jul-75	24	0.017	20-Jul-84	134	0.022
16-Jan-76	30	0.018	25-Jul-85	146	0.023
16-Jul-76	36	0.018	25-Jul-86	158	0.023
20-Jan-77	43	0.019	25-Jul-87	170	0.023
18-Jul-77	48	0.019	25-Jul-88	183	0.025
19-Jan-78	55	0.020	25-Jul-89	195	0.025
26-Jul-78	61	0.021			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

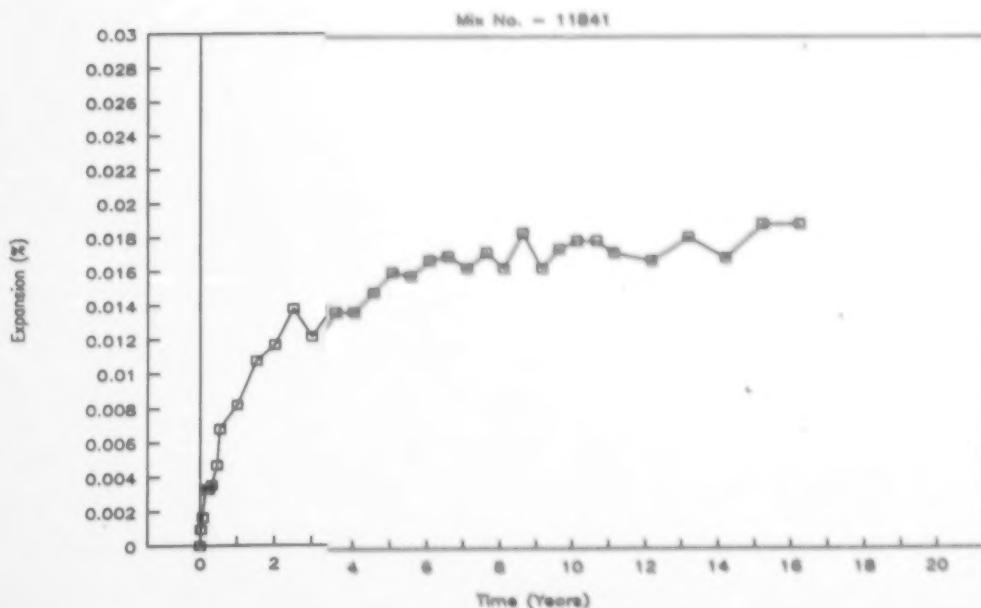
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	11841	Fine Aggregate:	S-6582 DIBBLE SAND
No. of Specimens :	3	Coarse Aggregate:	S-6574 HOFFMAN CR RK
Project :	ARNPRIOR GS	Cement:	CL66858 (ALK 1.02%)
Date Cast :	24-Jul-73		
Age (as of Jan 1/90) :	16 years		
Remarks :	Specimens stored at 23 C		

Test Data

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Jul-73	0.0	0.000	19-Jan-79	67	0.016
31-Jul-73	0.2	0.001	20-Jul-79	73	0.017
07-Aug-73	0.4	0.001	20-Jan-80	79	0.017
21-Aug-73	1	0.002	22-Jul-80	85	0.016
18-Sep-73	2	0.003	03-Feb-81	92	0.017
16-Oct-73	3	0.003	22-Jul-81	97	0.016
13-Nov-73	4	0.004	26-Jan-82	104	0.018
08-Jan-74	6	0.005	03-Aug-82	110	0.016
04-Feb-74	6	0.007	21-Jan-83	116	0.018
22-Jul-74	12	0.008	21-Jul-83	122	0.018
25-Jan-75	18	0.011	* 30-Jan-84	128	0.018
21-Jul-75	24	0.012	20-Jul-84	134	0.017
16-Jan-76	30	0.014	25-Jul-85	146	0.017
16-Jul-76	36	0.012	25-Jul-86	158	0.018
20-Jan-77	43	0.014	25-Jul-87	170	0.017
18-Jul-77	48	0.014	25-Jul-88	183	0.019
19-Jan-78	55	0.013	25-Jul-89	195	0.019
26-Jul-78	61	0.016			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

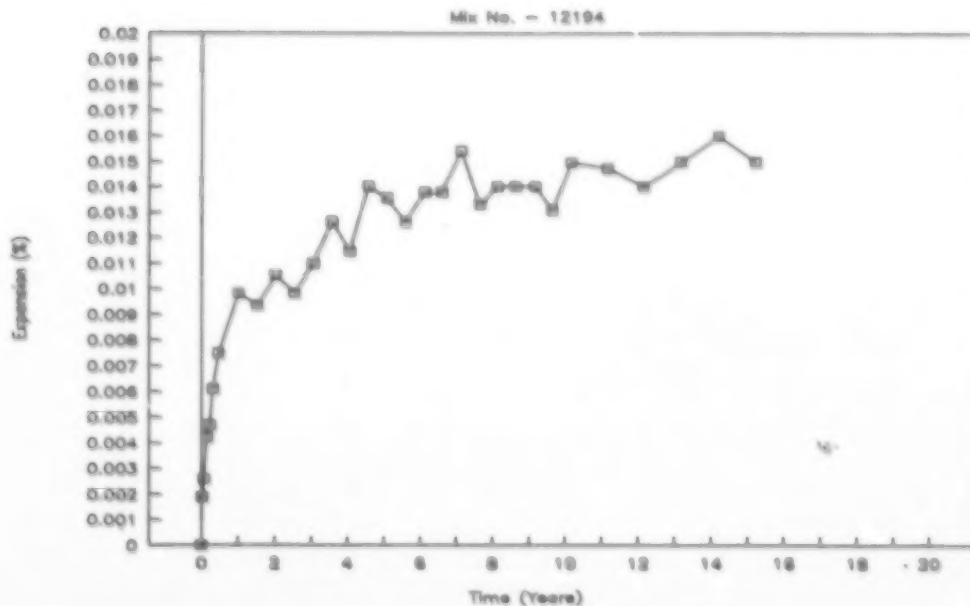
C5A CAN3-A23.2-14A

Mix No. : 12194
No. of Specimens : 3
Project : PICKERING GS "B"
Date Cast : 16-Jan-75
Age (as of Jan 1/90) : 15 years
Remarks : Specimens stored at 23 C

Fine Aggregate: S-6608 PARIS SAND
Coarse Aggregate: S-6437 PARIS CR GR
Cement: CL67942 (ALK 1.16%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Jan-75	0.0	0.000	02-Feb-81	74	0.014
23-Jan-75	0.2	0.002	20-Jul-81	79	0.014
30-Jan-75	0.4	0.002	25-Jan-82	86	0.015
13-Feb-75	1	0.003	03-Aug-82	92	0.013
13-Mar-75	2	0.004	21-Jan-83	98	0.014
10-Apr-75	3	0.005	21-Jul-83	104	0.014
08-May-75	4	0.006	30-Jan-84	110	0.014
03-Jul-75	6	0.007	20-Jul-84	116	0.013
16-Jan-76	12	0.010	23-Jan-85	122	0.015
16-Jul-76	18	0.009	20-Jan-86	134	0.015
17-Jan-77	24	0.011	12-Jan-87	146	0.014
18-Jul-77	30	0.010	14-Jan-88	158	0.015
19-Jan-78	37	0.011	17-Jan-89	170	0.016
26-Jul-78	43	0.013	17-Jan-90	183	0.015
19-Jan-79	49	0.011			
20-Jul-79	55	0.014			
19-Jan-80	61	0.014			
22-Jul-80	67	0.013			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

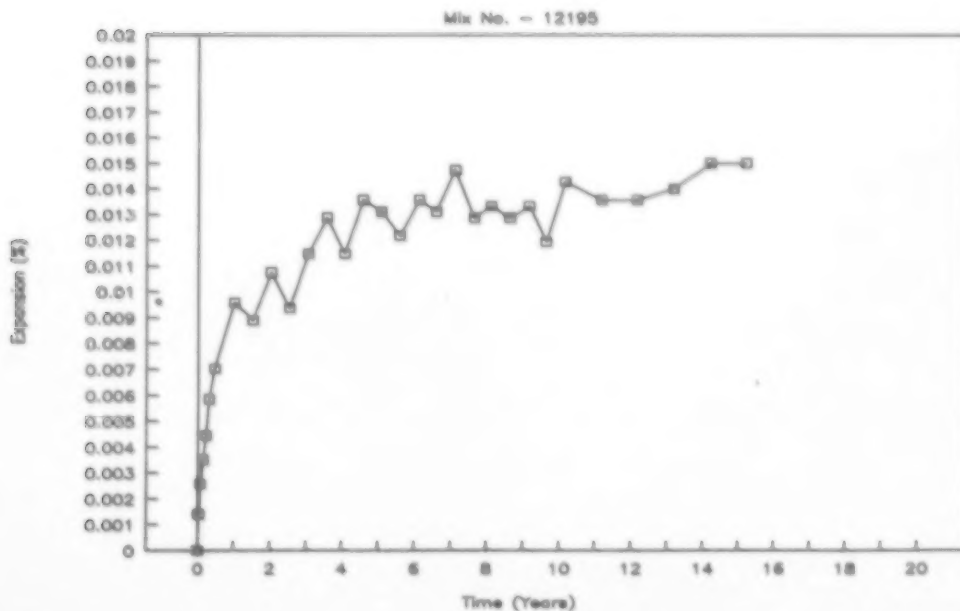
CSA CAN3-A23.2-14A

Mix No. : 12195
 No. of Specimens : 3
 Project : PICKERING GS "B"
 Date Cast : 16-Jan-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6720 MOSSPORT SAND
 Coarse Aggregate: S-6721/S-6726 MOSSPORT CR GR
 Cement: CL67942 (ALK 1.16%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
17-Jan-75	0.0	0.000	02-Feb-81	74	0.014
23-Jan-75	0.2	0.001	20-Jul-81	79	0.013
30-Jan-75	0.4	0.001	25-Jan-82	86	0.015
13-Feb-75	1	0.003	03-Aug-82	92	0.013
13-Mar-75	2	0.004	21-Jan-83	98	0.013
10-Apr-75	3	0.004	21-Jul-83	104	0.013
08-May-75	4	0.006	30-Jan-84	110	0.013
03-Jul-75	6	0.007	20-Jul-84	116	0.012
16-Jan-76	12	0.010	23-Jan-85	122	0.014
16-Jul-76	18	0.009	20-Jan-86	134	0.014
17-Jan-77	24	0.011	12-Jan-87	146	0.014
18-Jul-77	30	0.009	14-Jan-88	158	0.014
19-Jan-78	37	0.011	17-Jan-89	170	0.015
26-Jul-78	43	0.013	14-Jan-90	183	0.015
19-Jan-79	49	0.011			
20-Jul-79	55	0.014			
19-Jan-80	61	0.013			
22-Jul-80	67	0.012			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

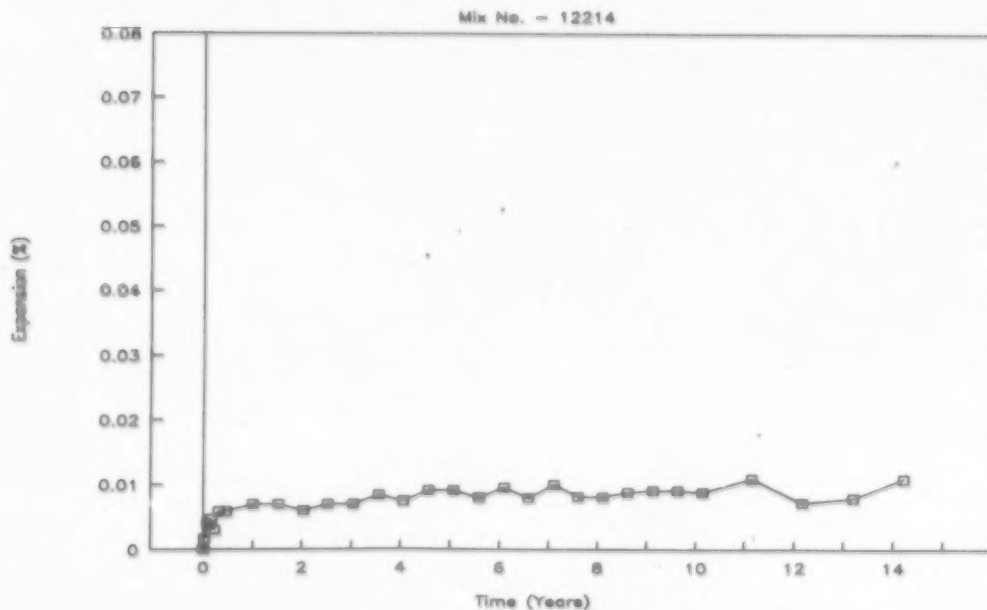
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12214 Fine Aggregate: S-6473 SPECULARITE
 No. of Specimens : 3 Coarse Aggregate: S-6738 INCO SLAG
 Project : INCO SLAG Cement: CL67942 LAB. STD. (ALK 1.16%)
 Date Cast : 04-Mar-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
05-Mar-75	0.0	0.000	06-Mar-81	73	0.010
11-Mar-75	0.2	0.002	04-Sep-81	79	0.008
18-Mar-75	0.4	0.002	08-Mar-82	85	0.010
01-Apr-75	1	0.004	03-Sep-82	91	0.008
29-Apr-75	2	0.003	03-Mar-83	97	0.008
27-May-75	3	0.003	02-Sep-83	103	0.009
24-Jun-75	4	0.006	05-Mar-84	110	0.009
19-Aug-75	6	0.006	04-Sep-84	116	0.009
04-Mar-76	12	0.007	05-Mar-85	122	0.009
03-Sep-76	18	0.007	04-Mar-86	134	0.011
04-Mar-77	24	0.006	04-Mar-87	146	0.007
02-Sep-77	30	0.007	07-Mar-88	158	0.008
03-Mar-78	36	0.007	06-Mar-89	171	0.011
11-Sep-78	43	0.008			
06-Mar-79	49	0.007			
05-Sep-79	55	0.009			
04-Mar-80	61	0.009			
05-Sep-80	67	0.008			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

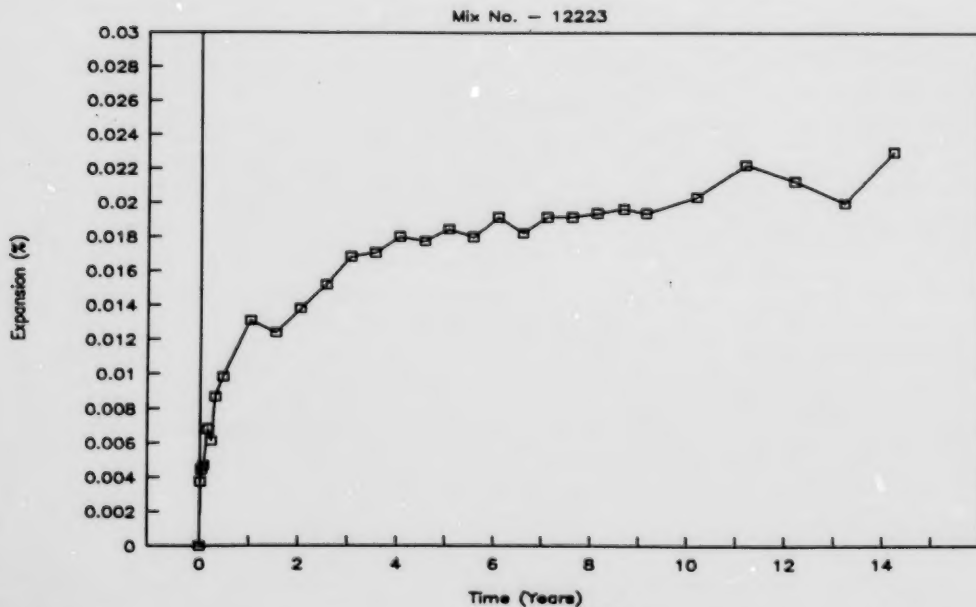
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	12223	Fine Aggregate:	S-6608 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6437 PARIS CR GR
Project :	BRUCE GS	Cement:	CL67942 (ALK 2.0%)
Date Cast :	09-Apr-75		
Age (as of Jan 1/90) :	15 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
10-Apr-75	0.0	0.000	10-Apr-81	73	0.019
16-Apr-75	0.2	0.004	09-Oct-81	79	0.018
23-Apr-75	0.4	0.004	08-Apr-82	85	0.019
07-May-75	1	0.005	08-Oct-82	91	0.019
07-Jun-75	2	0.007	11-Apr-83	97	0.019
02-Jul-75	3	0.006	27-Oct-83	104	0.020
30-Jul-75	4	0.009	10-Apr-84	110	0.019
24-Sep-75	6	0.010	16-Apr-85	122	0.020
09-Apr-76	12	0.013	10-Apr-86	134	0.022
10-Oct-76	18	0.012	08-Apr-87	146	0.021
07-Apr-77	24	0.014	09-Apr-88	158	0.020
11-Oct-77	31	0.015	07-Apr-89	170	0.023
10-Apr-78	37	0.017			
11-Oct-78	43	0.017			
10-Apr-79	49	0.018			
12-Oct-79	55	0.018			
09-Apr-80	61	0.018			
09-Oct-80	67	0.018			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

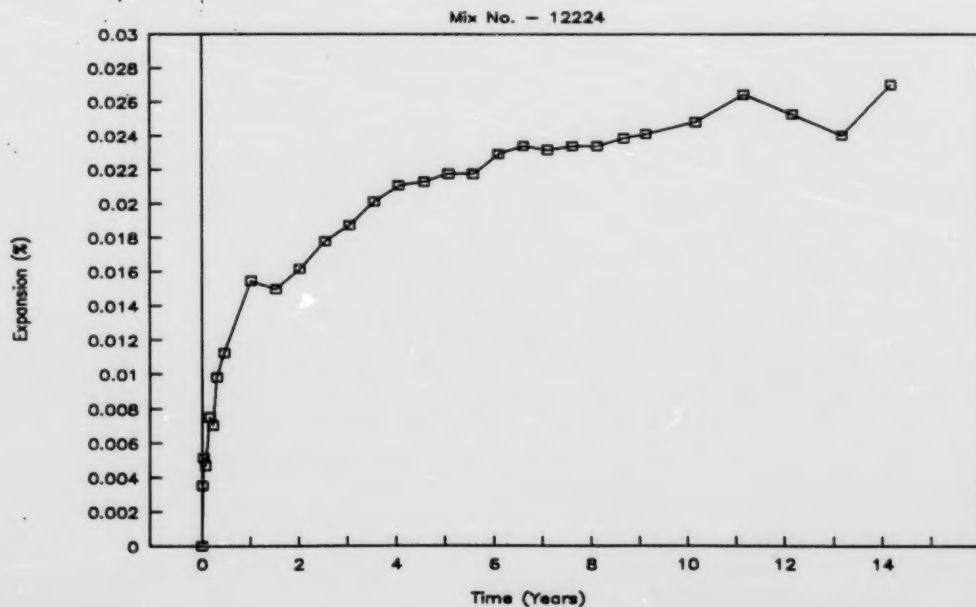
CSA CAN3-A23.2-14A

Mix No. : 12224
 No. of Specimens : 3
 Project : BRUCE GS
 Date Cast : 09-Apr-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6739A YUNDT PIT
 Coarse Aggregate: S-6740A YUNDT PIT
 Cement: CL67942 (ALK 2.0%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
10-Apr-75	0.0	0.000	10-Apr-81	73	0.023
16-Apr-75	0.2	0.004	09-Oct-81	79	0.023
23-Apr-75	0.4	0.005	08-Apr-82	85	0.023
07-May-75	1	0.005	08-Oct-82	91	0.023
07-Jun-75	2	0.007	11-Apr-83	97	0.023
02-Jul-75	3	0.007	27-Oct-83	104	0.024
30-Jul-75	4	0.010	10-Apr-84	110	0.024
24-Sep-75	6	0.011	16-Apr-85	122	0.025
09-Apr-76	12	0.015	10-Apr-86	134	0.026
10-Oct-76	18	0.015	08-Apr-87	146	0.025
07-Apr-77	24	0.016	09-Apr-88	158	0.024
11-Oct-77	31	0.018	07-Apr-89	170	0.027
10-Apr-78	37	0.019			
11-Oct-78	43	0.020			
10-Apr-79	49	0.021			
12-Oct-79	55	0.021			
09-Apr-80	61	0.022			
09-Oct-80	67	0.022			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

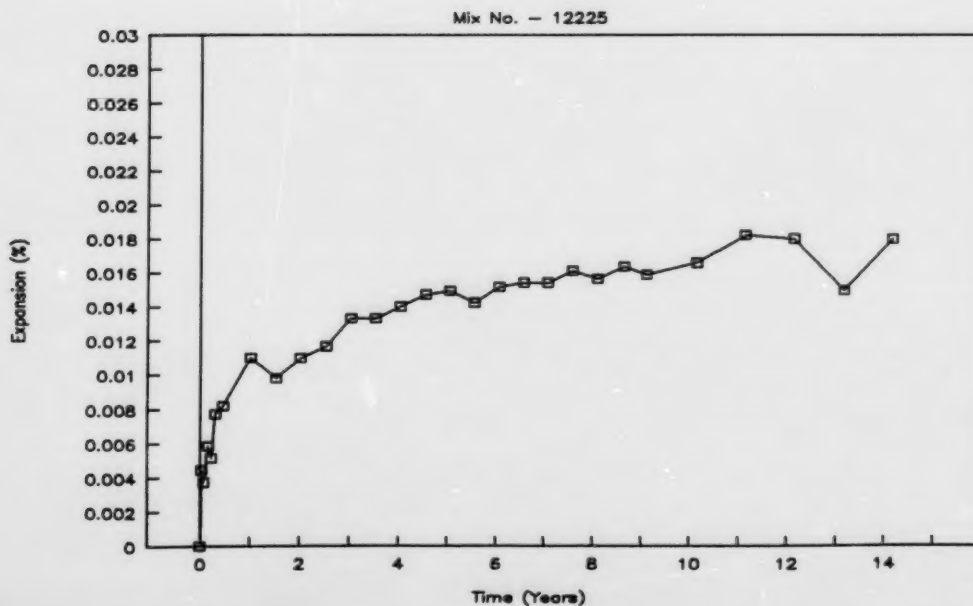
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	12225	Fine Aggregate:	S-6739A YUNDT PIT
No. of Specimens :	3	Coarse Aggregate:	S-6740A YUNDT PIT
Project :	BRUCE GS	Cement:	CL67942 (ALK 1.16%)
Date Cast :	09-Apr-75		
Age (as of Jan 1/90) :	15 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
10-Apr-75	0.0	0.000	10-Apr-81	73	0.015
16-Apr-75	0.2	-0.007	09-Oct-81	79	0.015
23-Apr-75	0.4	0.004	08-Apr-82	85	0.015
07-May-75	1	0.004	08-Oct-82	91	0.016
07-Jun-75	2	0.006	11-Apr-83	97	0.016
02-Jul-75	3	0.005	27-Oct-83	104	0.016
30-Jul-75	4	0.008	10-Apr-84	110	0.016
24-Sep-75	6	0.008	16-Apr-85	122	0.017
09-Apr-76	12	0.011	10-Apr-86	134	0.018
10-Oct-76	18	0.010	08-Apr-87	146	0.018
07-Apr-77	24	0.011	09-Apr-88	158	0.015
11-Oct-77	31	0.012	07-Apr-89	170	0.018
10-Apr-78	37	0.013			
11-Oct-78	43	0.013			
10-Apr-79	49	0.014			
12-Oct-79	55	0.015			
09-Apr-80	61	0.015			
09-Oct-80	67	0.014			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

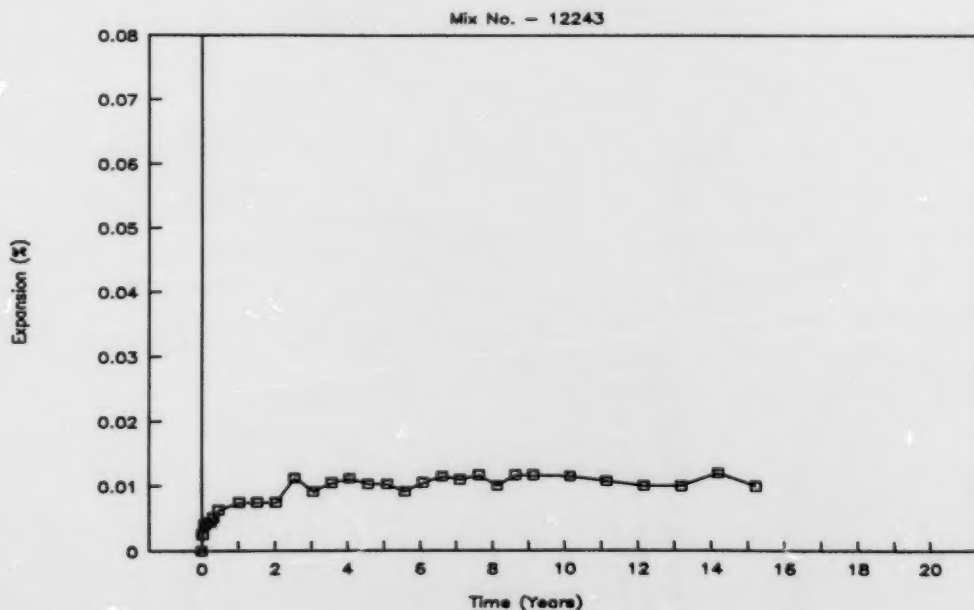
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12243 Fine Aggregate: S-6608 PARIS SAND
 No. of Specimens : 3 Coarse Aggregate: S-6747 INCO SLAG
 Project : INCO SLAG Cement: CL67942 LAB. STD. (ALK 1.16%)
 Date Cast : 22-Apr-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C
 One specimen developed hairline cracks on face (21-Oct-77)
 One specimen developed two small popouts (21-Apr-79)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Apr-75	0.0	0.000	23-Oct-80	67	0.009
29-Apr-75	0.2	0.003	21-Apr-81	73	0.011
06-May-75	0.4	0.003	27-Oct-81	79	0.011
20-May-75	1	0.004	22-Apr-82	85	0.011
17-Jun-75	2	0.004	27-Oct-82	91	0.012
15-Jul-75	3	0.004	25-Apr-83	97	0.010
12-Aug-75	4	0.005	27-Oct-83	104	0.012
07-Oct-75	6	0.006	24-Apr-84	110	0.012
22-Apr-76	12	0.007	25-Apr-85	122	0.011
22-Oct-76	18	0.007	21-Apr-86	134	0.011
22-Apr-77	24	0.007	21-Apr-87	146	0.010
21-Oct-77	30	0.011	21-Apr-88	158	0.010
24-Apr-78	37	0.009	21-Apr-89	170	0.012
23-Oct-78	43	0.011	20-Apr-90	183	0.010
21-Apr-79	49	0.011			
22-Oct-79	55	0.010			
24-Apr-80	61	0.010			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

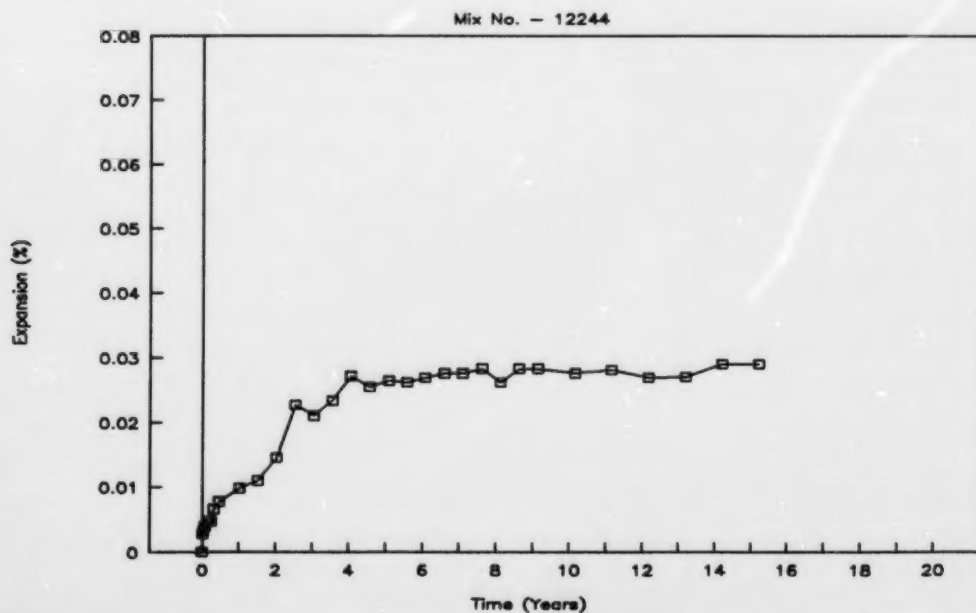
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12244 Fine Aggregate: S-6608 PARIS SAND
 No. of Specimens : 3 Coarse Aggregate: S-6747 INCO SLAG
 Project : INCO SLAG Cement: CL67942 LAB. STD. (ALK 2.0%)
 Date Cast : 22-Apr-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Apr-75	0.0	0.000	21-Apr-81	73	0.027
29-Apr-75	0.2	0.003	27-Oct-81	79	0.028
06-May-75	0.4	0.003	22-Apr-82	85	0.028
20-May-75	1	0.004	27-Oct-82	91	0.028
17-Jun-75	2	0.005	25-Apr-83	97	0.026
15-Jul-75	3	0.005	27-Oct-83	104	0.028
12-Aug-75	4	0.007	24-Apr-84	110	0.028
07-Oct-75	6	0.008	25-Apr-85	122	0.028
22-Apr-76	12	0.010	21-Apr-86	134	0.028
22-Oct-76	18	0.011	21-Apr-87	146	0.027
22-Apr-77	24	0.015	21-Apr-88	158	0.027
21-Oct-77	30	0.023	21-Apr-89	170	0.029
24-Apr-78	37	0.021	20-Apr-90	183	0.029
23-Oct-78	43	0.023			
21-Apr-79	49	0.027			
22-Oct-79	55	0.025			
24-Apr-80	61	0.026			
23-Oct-80	67	0.026			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

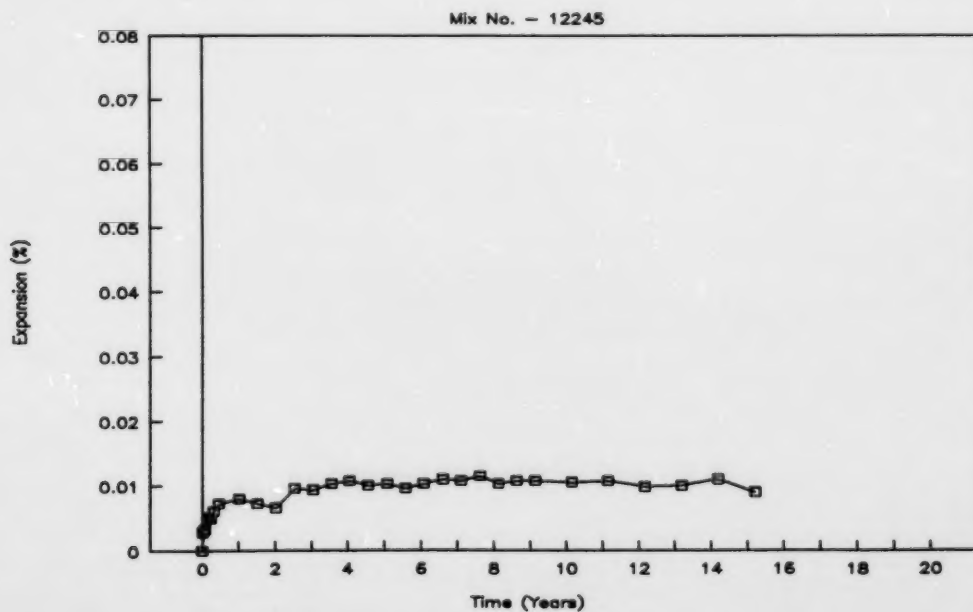
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12245 Fine Aggregate: S-6747 INCO SLAG
 No. of Specimens : 3 Coarse Aggregate: S-6473 SPECULARITE
 Project : INCO SLAG Cement: CL67942 LAB. STD. (ALK 1.16%)
 Date Cast : 22-Apr-75
 Age (as of Jan 1/90) : 15 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Apr-75	0.0	0.000	21-Apr-81	73	0.010
29-Apr-75	0.2	0.003	27-Oct-81	79	0.011
06-May-75	0.4	0.003	22-Apr-82	85	0.011
20-May-75	1	0.003	27-Oct-82	91	0.011
17-Jun-75	2	0.005	25-Apr-83	97	0.010
15-Jul-75	3	0.005	27-Oct-83	104	0.011
12-Aug-75	4	0.006	24-Apr-84	110	0.011
07-Oct-75	6	0.007	25-Apr-85	122	0.011
22-Apr-76	12	0.008	21-Apr-86	134	0.011
22-Oct-76	18	0.007	21-Apr-87	146	0.010
22-Apr-77	24	0.007	21-Apr-88	158	0.010
21-Oct-77	30	0.010	21-Apr-89	170	0.011
24-Apr-78	37	0.009	20-Apr-90	183	0.009
23-Oct-78	43	0.010			
21-Apr-79	49	0.011			
22-Oct-79	55	0.010			
24-Apr-80	61	0.010			
23-Oct-80	67	0.010			



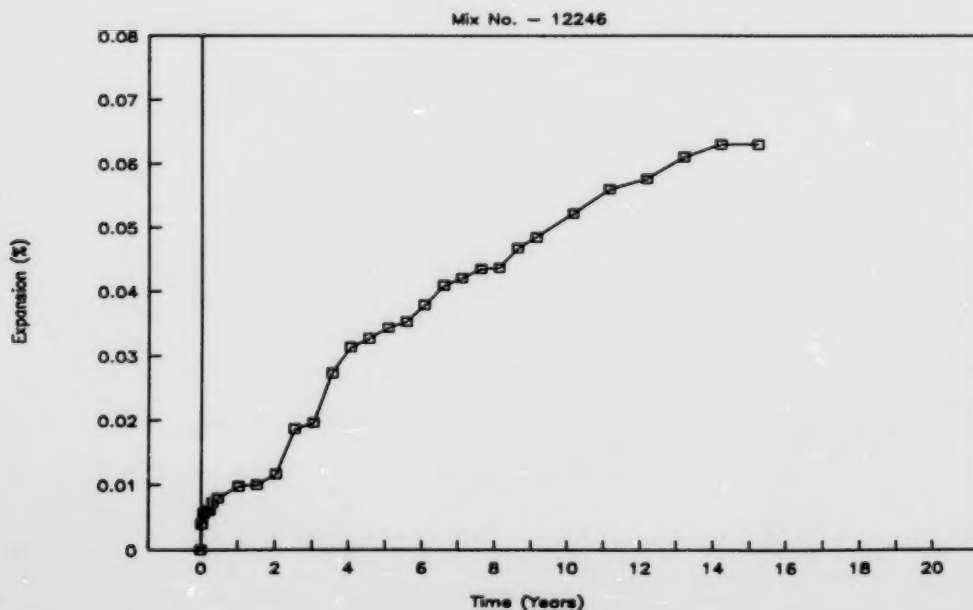
POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12246 Fine Aggregate: S-6473 SPECULARITE
No. of Specimens : 3 Coarse Aggregate: S-6747 INCO SLAG
Project : INCO SLAG Cement: CL67942 LAB. STD. (ALK 2.0%)
Date Cast : 22-Apr-75
Age (as of Jan 1/90) : 15 years
Remarks : Specimens stored at 23 C
Several cracks developed on face of specimen (24-Oct-77) and (24-Apr-78)
Cracks developed on other two specimens (23-Oct-79) and (21-Apr-79)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Apr-75	0.0	0.000	23-Oct-80	67	0.035
29-Apr-75	0.2	0.004	21-Apr-81	73	0.038
06-May-75	0.4	0.004	27-Oct-81	79	0.041
20-May-75	1	0.006	22-Apr-82	85	0.042
17-Jun-75	2	0.006	27-Oct-82	91	0.044
15-Jul-75	3	0.006	25-Apr-83	97	0.044
12-Aug-75	4	0.007	27-Oct-83	104	0.047
07-Oct-75	6	0.008	24-Apr-84	110	0.048
22-Apr-76	12	0.010	25-Apr-85	122	0.052
22-Oct-76	18	0.010	21-Apr-86	134	0.056
22-Apr-77	24	0.012	21-Apr-87	146	0.058
21-Oct-77	30	0.019	21-Apr-88	158	0.061
24-Apr-78	37	0.020	21-Apr-89	170	0.063
23-Oct-78	43	0.027	20-Apr-90	183	0.063
21-Apr-79	49	0.031			
22-Oct-79	55	0.033			
24-Apr-80	61	0.034			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

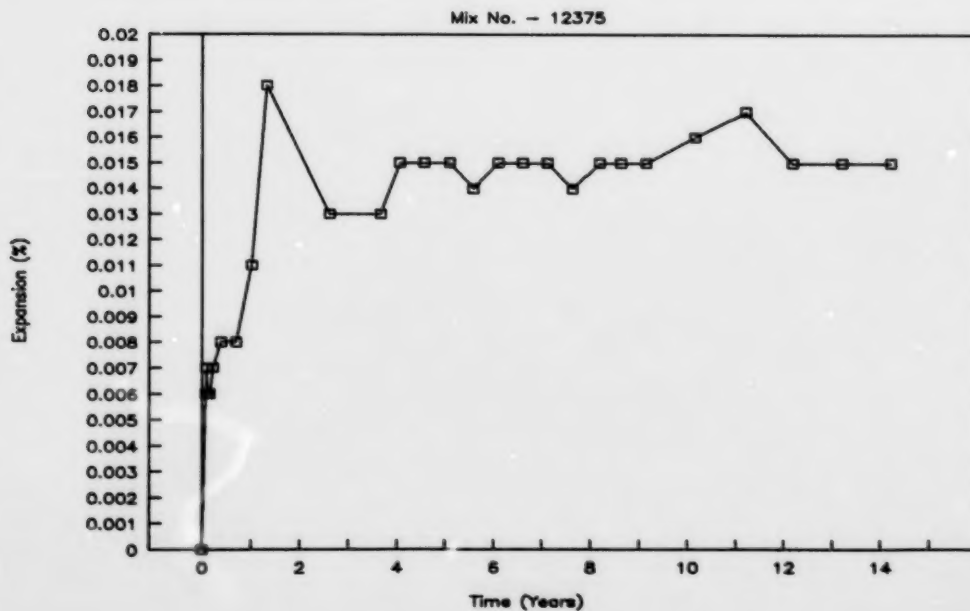
CSA CAN3-A23.2-14A

Mix No. : 12375
 No. of Specimens : 1
 Project : HIGH DENSITY AGGREGATES
 Date Cast : 12-Nov-75
 Age (as of Jan 1/90) : 14 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6760 ORTON MINE
 Coarse Aggregate: S-6760 ORTON MINE
 Cement: CL68222 (ALK 0.91%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
13-Nov-75	0	0.000	12-Nov-82	85	0.015
10-Dec-75	1	0.006	17-May-83	91	0.014
17-Dec-75	1	0.007	05-Dec-83	98	0.015
24-Dec-75	1	0.006	10-May-84	103	0.015
07-Jan-76	2	0.006	13-Nov-84	110	0.015
04-Feb-76	3	0.007	13-Nov-85	122	0.016
31-Mar-76	5	0.008	25-Nov-86	134	0.017
21-Jul-76	8	0.008	10-Nov-87	146	0.015
12-Nov-76	12	0.011	11-Nov-88	158	0.015
02-Mar-77	16	0.018	10-Nov-89	170	0.015
08-Jun-78	31	0.013			
22-Jun-79	44	0.013			
12-Nov-79	49	0.015			
12-May-80	55	0.015			
19-Nov-80	61	0.015			
12-May-81	67	0.014			
13-Nov-81	73	0.015			
12-May-82	79	0.015			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

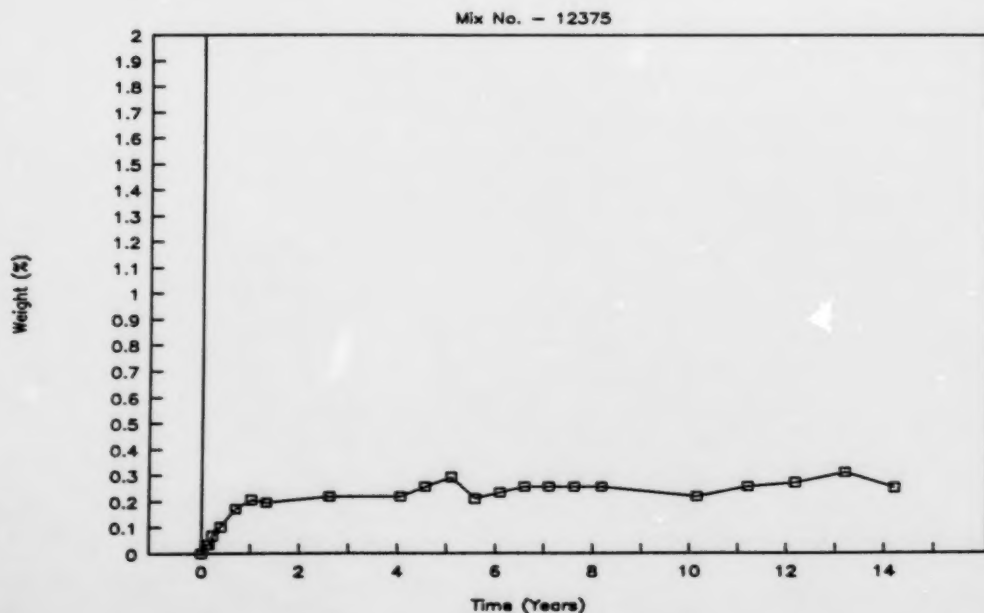
CSA CAN3-A23.2-14A

Mix No. : 12375
 No. of Specimens : 1
 Project : HIGH DENSITY AGGREGATES
 Date Cast : 12-Nov-75
 Age (as of Jan 1/90) : 14 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6760 ORTON MINE
 Coarse Aggregate: S-6760 ORTON MINE
 Cement: CL68222 (ALK 0.91%)

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
13-Nov-75	0	0.000	05-Dec-83	98	0.255
17-Dec-75	1	0.034	13-Nov-85	122	0.217
24-Dec-75	1	0.034	25-Nov-86	134	0.255
07-Jan-76	2	0.034	10-Nov-87	146	0.270
04-Feb-76	3	0.068	11-Nov-88	158	0.310
31-Mar-76	5	0.102	10-Nov-89	170	0.250
21-Jul-76	8	0.171			
12-Nov-76	12	0.205			
02-Mar-77	16	0.195			
08-Jun-78	31	0.217			
12-Nov-79	49	0.217			
12-May-80	55	0.255			
19-Nov-80	61	0.293			
12-May-81	67	0.210			
13-Nov-81	73	0.233			
12-May-82	79	0.255			
12-Nov-82	85	0.255			
17-May-83	91	0.255			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

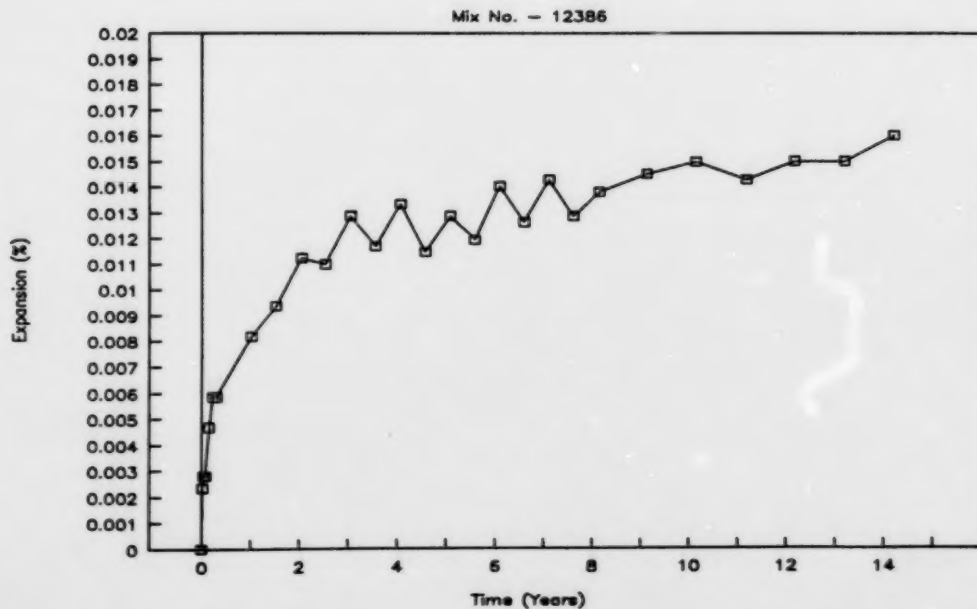
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12386
 No. of Specimens : 3
 Project : WESLEYVILLE GS
 Date Cast : 25-Nov-75
 Age (as of Jan 1/90) : 14 years
 Remarks : Specimens stored at 23 C
 Chipped corner on one specimen (01-Dec-77)
 Fine Aggregate: S-6791 BRIGHTON PIT
 Coarse Aggregate: S-6789 BRIGHTON PIT
 Cement: CL68222 (ALK 0.91%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-Nov-75	0.0	0.000	26-May-82	79	0.013
03-Dec-75	0.2	0.002	26-Nov-82	85	0.014
10-Dec-75	0.5	0.003	26-May-83	91	0.013
24-Dec-75	1	0.003	05-Dec-83	98	0.014
21-Jan-76	2	0.005	26-Nov-84	110	0.015
18-Feb-76	3	0.006	26-Nov-85	122	0.015
17-Mar-76	4	0.006	03-Dec-86	134	0.014
26-Nov-76	12	0.008	26-Nov-87	146	0.015
26-May-77	18	0.009	25-Nov-88	158	0.015
01-Dec-77	25	0.011	24-Nov-89	170	0.016
26-May-78	30	0.011			
26-Nov-78	37	0.013			
30-May-79	43	0.012			
28-Nov-79	49	0.013			
26-May-80	55	0.011			
26-Nov-80	61	0.013			
26-May-81	67	0.012			
26-Nov-81	73	0.014			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

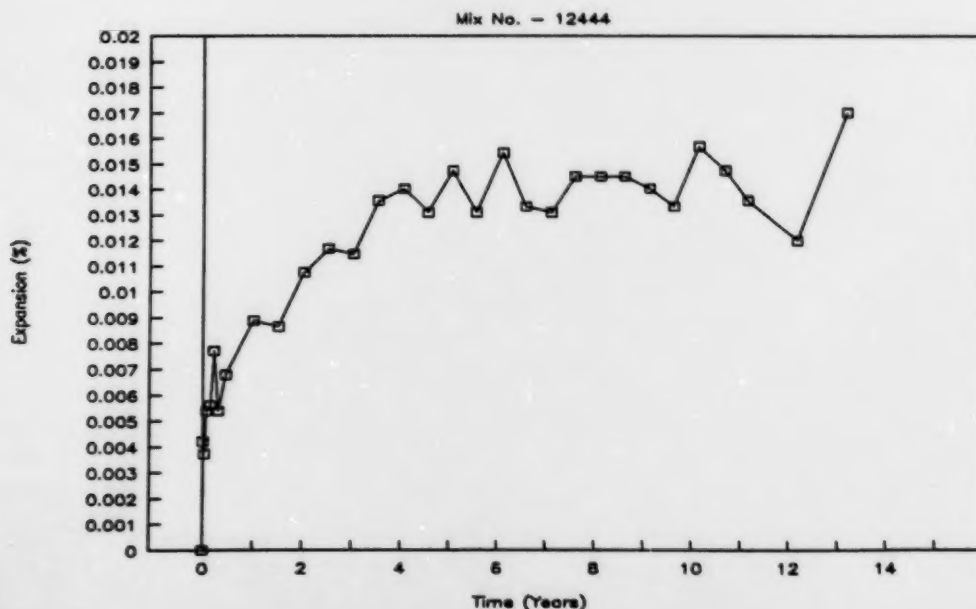
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12444 Fine Aggregate: S-6608 PARIS SAND
 No. of Specimens : 3 Coarse Aggregate: S-6790 BEAUHARNOIS
 Project : BEAUHARNOIS Cement: CL68222 LAB. STD. (ALK 0.91%)
 Date Cast : 24-Feb-76
 Age (as of Jan 1/90) : 14 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Feb-76	0.0	0.000	08-Mar-82	73	0.015
02-Mar-76	0.2	0.004	23-Aug-82	79	0.013
09-Mar-76	0.4	0.004	03-Mar-83	85	0.013
23-Mar-76	1	0.005	26-Aug-83	91	0.015
20-Apr-76	2	0.006	28-Feb-84	98	0.015
18-May-76	3	0.008	24-Aug-84	103	0.015
17-Jun-76	4	0.005	25-Feb-85	110	0.014
10-Aug-76	6	0.007	23-Aug-85	116	0.013
24-Feb-77	12	0.009	24-Feb-86	122	0.016
24-Aug-77	18	0.009	04-Sep-86	128	0.015
24-Feb-78	24	0.011	23-Feb-87	134	0.014
21-Aug-78	30	0.012	24-Feb-88	146	0.012
21-Feb-79	36	0.011	24-Feb-89	158	0.017
24-Aug-79	43	0.014			
28-Feb-80	49	0.014			
22-Aug-80	55	0.013			
24-Feb-81	61	0.015			
24-Aug-81	67	0.013			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

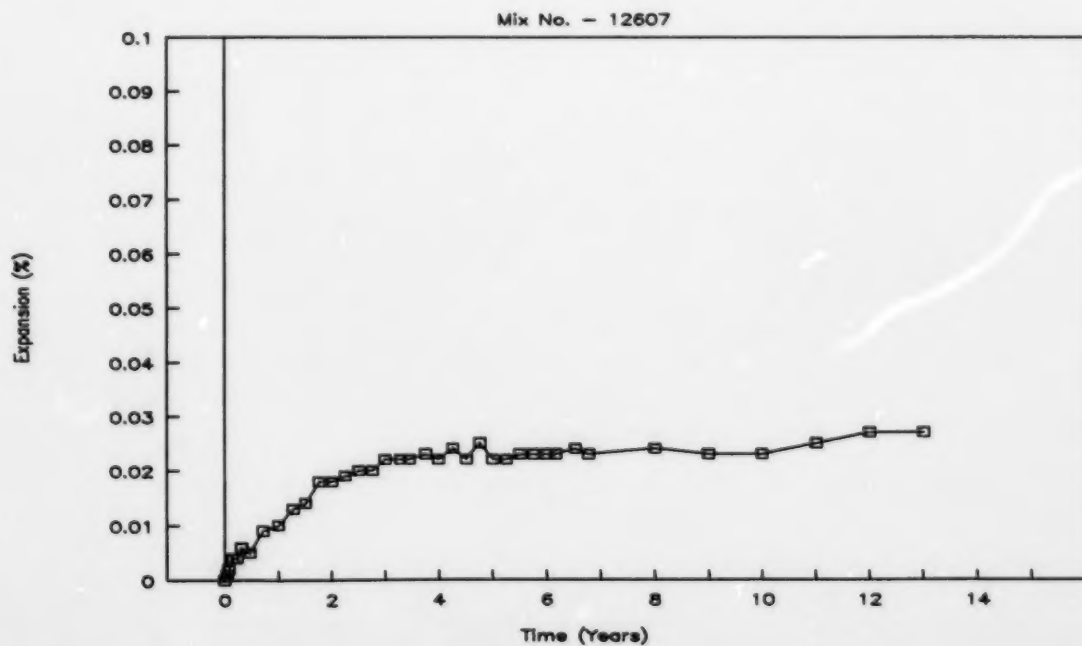
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12607 Fine Aggregate: S-6761 SPECULARITE
 No. of Specimens : 1 Coarse Aggregate: S-6928 PANCAKE LAKE CORE
 Project : HIGH DENSITY AGGREGATES Cement: CL68764 LAB. STD. (ALK 1.04%)
 Date Cast : 29-Mar-77
 Age (as of Jan 1/90) : 13 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
30-Mar-77	0.0	0.000	28-Sep-79	30	0.020	27-May-83	74	0.023
05-Apr-77	0.0	-0.001	02-Jan-80	33	0.020	07-Oct-83	78	0.024
12-Apr-77	0.5	0.001	28-Mar-80	36	0.022	04-Jan-84	81	0.023
26-Apr-77	1	0.002	10-Jul-80	39	0.022	29-Mar-85	96	0.024
25-May-77	2	0.004	10-Sep-80	41	0.022	27-Mar-86	108	0.023
21-Jun-77	3	0.004	30-Dec-80	45	0.023	27-Mar-87	120	0.023
19-Jul-77	4	0.006	27-Mar-81	48	0.022	29-Mar-88	132	0.025
13-Sep-77	6	0.005	30-Jun-81	51	0.024	29-Mar-89	144	0.027
13-Dec-77	9	0.009	02-Oct-81	54	0.022	29-Mar-90	156	0.027
29-Mar-78	12	0.010	31-Dec-81	57	0.025			
06-Jul-78	15	0.013	30-Mar-82	60	0.022			
29-Sep-78	18	0.014	30-Jun-82	63	0.022			
02-Jan-79	21	0.018	30-Sep-82	66	0.023			
29-Mar-79	24	0.018	29-Dec-82	69	0.023			
29-Jun-79	27	0.019	30-Mar-83	72	0.023			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

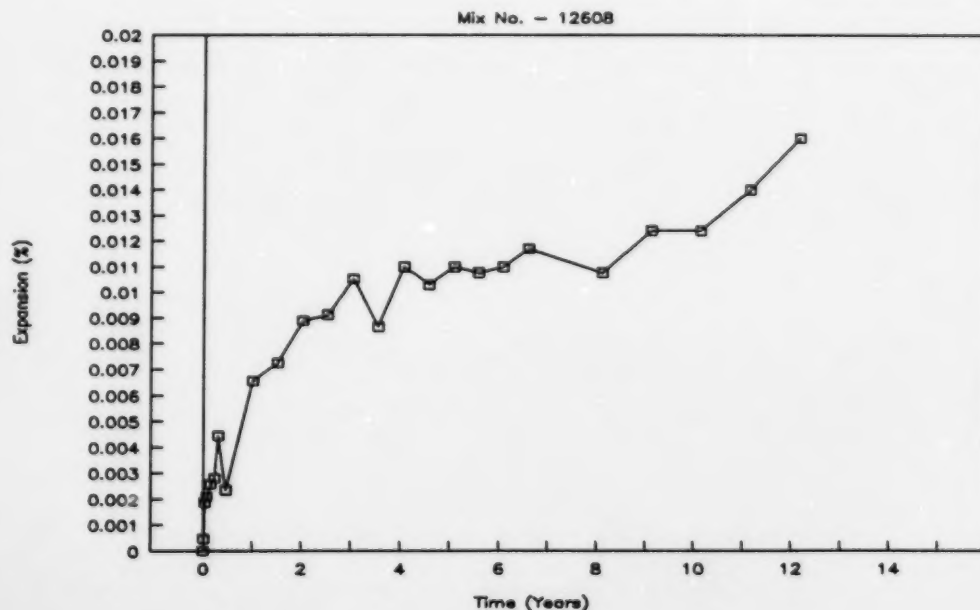
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12608 Fine Aggregate: S-6608 PARIS SAND
 No. of Specimens : 3 Coarse Aggregate: S-6376 DUNDAS CR ST
 Project : CONTROL Cement: CL68764 LAB. STD. (ALK 1.04%)
 Date Cast : 31-Mar-77
 Age (as of Jan 1/90) : 13 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp
01-Apr-77	0.0	0.000	31-Mar-83	73	0.011
07-Apr-77	0.2	0.000	30-Sep-83	79	0.012
14-Apr-77	0.4	0.002	29-Mar-85	97	0.011
28-Apr-77	1	0.002	27-Mar-86	109	0.012
26-May-77	2	0.003	31-Mar-87	122	0.012
24-Jun-77	3	0.003	31-Mar-88	134	0.014
21-Jul-77	4	0.004	31-Mar-89	146	0.016
15-Sep-77	6	0.002			
31-Mar-78	12	0.007			
29-Sep-78	18	0.007			
29-Mar-79	24	0.009			
28-Sep-79	30	0.009			
31-Mar-80	37	0.011			
29-Sep-80	43	0.009			
03-Apr-81	49	0.011			
02-Oct-81	55	0.010			
05-Apr-82	61	0.011			
30-Sep-82	67	0.011			



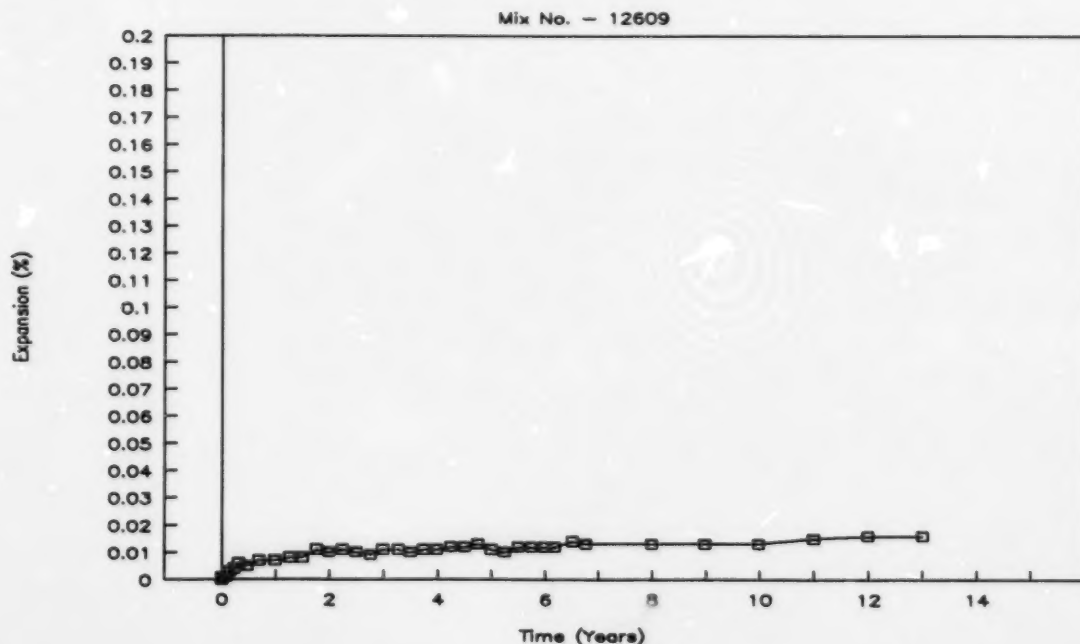
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12609	Fine Aggregate: S-6608 PARIS SAND
No. of Specimens : 1	Coarse Aggregate: S-6437 PARIS CR GR
Project : CONTROL	Cement: CL68764 LAB. STD. (ALK 1.04%)
Date Cast : 05-Apr-77	
Age (as of Jan 1/90) : 13 years	
Remarks : Specimens stored at 23 C	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Apr-77	0.0	0.000	02-Jan-80	33	0.009	04-Jan-84	81	0.013
12-Apr-77	0.0	0.001	28-Mar-80	36	0.011	29-Mar-85	96	0.013
19-Apr-77	0.5	0.001	10-Jul-80	39	0.011	27-Mar-86	108	0.013
03-May-77	1	0.001	30-Sep-80	42	0.010	27-Mar-87	120	0.013
31-May-77	2	0.003	30-Dec-80	45	0.011	29-Mar-88	132	0.015
28-Jun-77	3	0.004	27-Mar-81	48	0.011	29-Mar-89	144	0.016
26-Jul-77	4	0.006	30-Jun-81	51	0.012	29-Mar-90	156	0.016
20-Sep-77	6	0.005	02-Oct-81	54	0.012			
13-Dec-77	8	0.007	31-Dec-81	57	0.013			
29-Mar-78	12	0.007	30-Mar-82	60	0.011			
06-Jul-78	15	0.008	30-Jun-82	63	0.010			
29-Sep-78	18	0.008	30-Sep-82	66	0.012			
03-Jan-79	21	0.011	29-Dec-82	69	0.012			
29-Mar-79	24	0.010	30-Mar-83	72	0.012			
29-Jun-79	27	0.011	03-Jun-83	74	0.012			
28-Sep-79	30	0.010	07-Oct-83	78	0.014			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

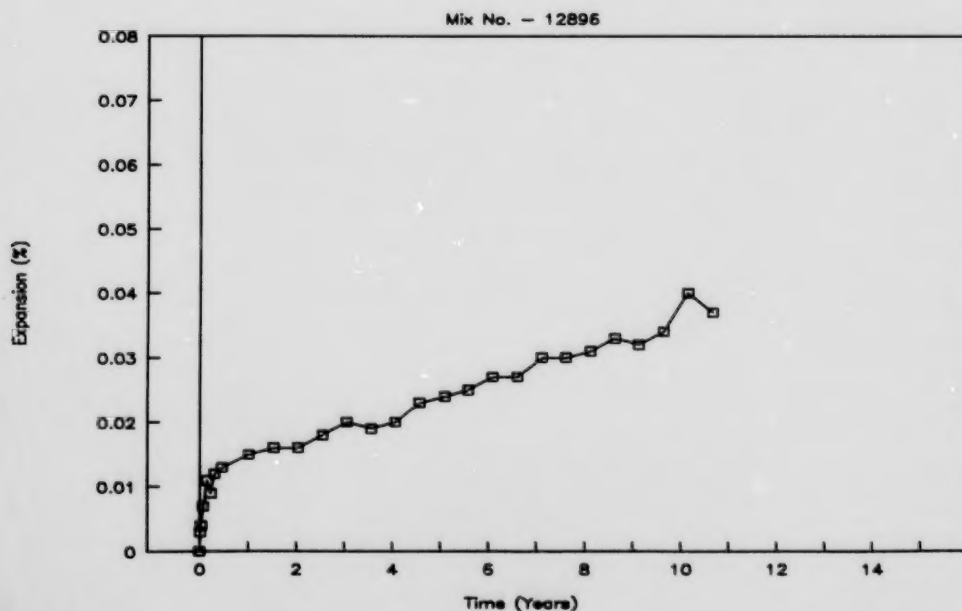
CSA CAN3-A23.2-14A

Mix No. : 12896
 No. of Specimens : 1
 Project : SELECTED AGGREGATES
 Date Cast : 07-Mar-79
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7115 WESLEYVILLE FDN
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Mar-79	0.0	0.000	08-Mar-85	73	0.027
14-Mar-79	0.2	0.003	09-Sep-85	79	0.027
21-Mar-79	0.4	0.004	08-Mar-86	85	0.030
04-Apr-79	1	0.007	09-Sep-86	91	0.030
02-May-79	2	0.011	09-Mar-87	97	0.031
30-May-79	3	0.009	08-Sep-87	104	0.033
27-Jun-79	4	0.012	07-Mar-88	110	0.032
22-Aug-79	6	0.013	08-Sep-88	116	0.034
07-Mar-80	12	0.015	08-Mar-89	122	0.040
08-Sep-80	18	0.016	08-Sep-89	128	0.037
09-Mar-81	24	0.016			
08-Sep-81	31	0.018			
08-Mar-82	37	0.020			
10-Sep-82	43	0.019			
10-Mar-83	49	0.020			
07-Sep-83	55	0.023			
15-Mar-84	61	0.024			
07-Sep-84	67	0.025			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

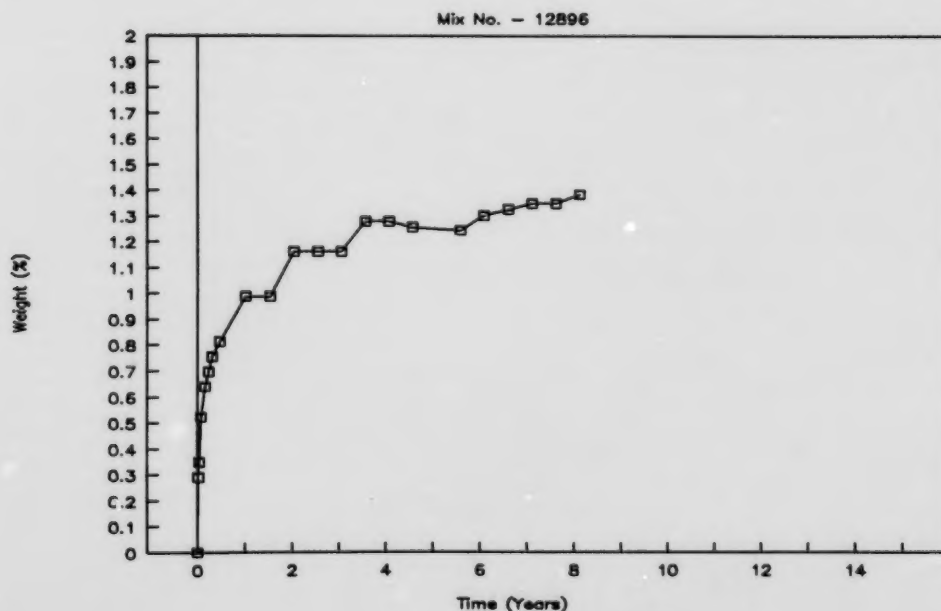
CSA CAN3-A23.2-14A

Mix No. : 12896
 No. of Specimens : 1
 Project : SELECTED AGGREGATES
 Date Cast : 07-Mar-79
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7115 WESLEYVILLE FDN
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
08-Mar-79	0.0	0.000	08-Mar-85	73	1.302
14-Mar-79	0.2	0.291	09-Sep-85	79	1.325
21-Mar-79	0.4	0.349	08-Mar-86	85	1.348
04-Apr-79	1	0.523	09-Sep-86	91	1.348
02-May-79	2	0.639	09-Mar-87	97	1.383
30-May-79	3	0.697			
27-Jun-79	4	0.755			
22-Aug-79	6	0.813			
07-Mar-80	12	0.988			
08-Sep-80	18	0.988			
09-Mar-81	24	1.162			
08-Sep-81	31	1.162			
08-Mar-82	37	1.162			
10-Sep-82	43	1.278			
10-Mar-83	49	1.278			
07-Sep-83	55	1.255			
07-Sep-84	67	1.243			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

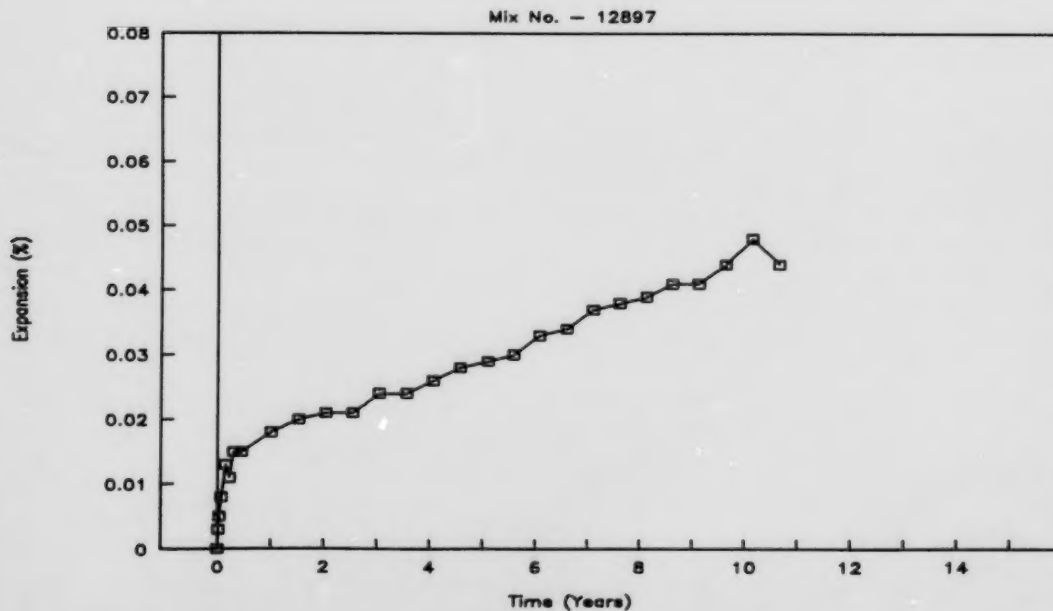
CSA CAN3-A23.2-14A

Mix No. : 12897
 No. of Specimens : 1
 Project : SELECTED AGGREGATES
 Date Cast : 07-Mar-79
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7116 ST MARY'S QUARRY
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Mar-79	0.0	0.000	08-Mar-85	73	0.033
14-Mar-79	0.2	0.003	09-Sep-85	79	0.034
21-Mar-79	0.4	0.005	08-Mar-86	85	0.037
04-Apr-79	1	0.008	09-Sep-86	91	0.038
02-May-79	2	0.013	09-Mar-87	97	0.039
30-May-79	3	0.011	08-Sep-87	104	0.041
27-Jun-79	4	0.015	07-Mar-88	110	0.041
22-Aug-79	6	0.015	08-Sep-88	116	0.044
07-Mar-80	12	0.018	08-Mar-89	122	0.048
08-Sep-80	18	0.020	08-Sep-89	128	0.044
09-Mar-81	24	0.021			
08-Sep-81	31	0.021			
08-Mar-82	37	0.024			
10-Sep-82	43	0.024			
10-Mar-83	49	0.026			
07-Sep-83	55	0.028			
15-Mar-84	61	0.029			
07-Sep-84	67	0.030			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

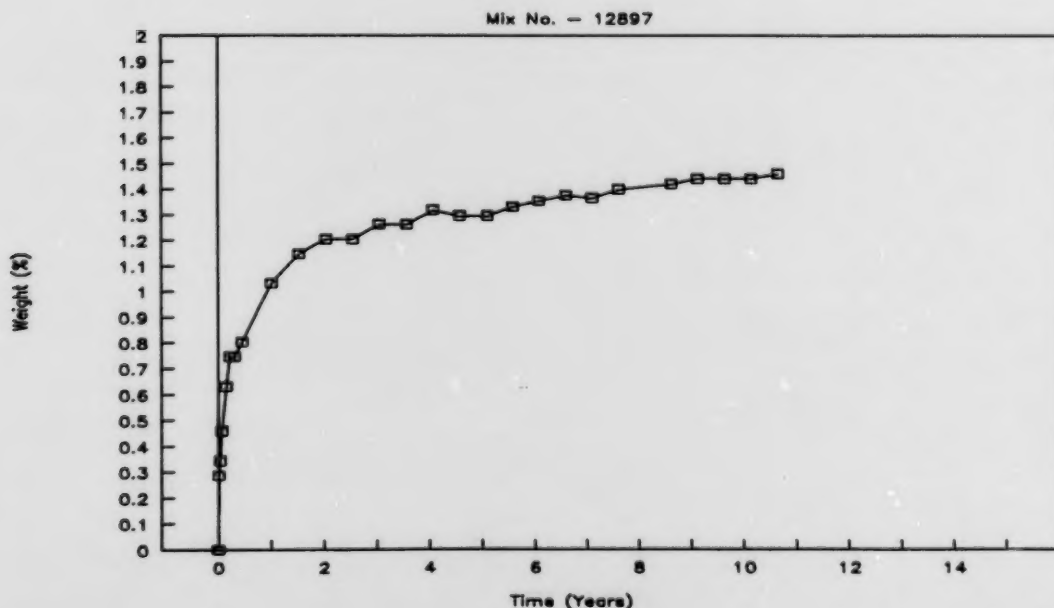
CSA CAN3-A23.2-14A

Mix No. : 12897
 No. of Specimens : 1
 Project : SELECTED AGGREGATES
 Date Cast : 07-Mar-79
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7116 ST MARY'S QUARRY
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
08-Mar-79	0.0	0.000	08-Mar-85	73	1.353
14-Mar-79	0.2	0.287	09-Sep-85	79	1.376
21-Mar-79	0.4	0.344	08-Mar-86	85	1.365
04-Apr-79	1	0.459	09-Sep-86	91	1.399
02-May-79	2	0.631	08-Sep-87	104	1.420
30-May-79	3	0.745	07-Mar-88	110	1.440
27-Jun-79	4	0.745	08-Sep-88	116	1.440
22-Aug-79	6	0.803	08-Mar-89	122	1.440
07-Mar-80	12	1.032	08-Sep-89	128	1.460
08-Sep-80	18	1.147			
09-Mar-81	24	1.204			
08-Sep-81	31	1.204			
08-Mar-82	37	1.261			
10-Sep-82	43	1.261			
10-Mar-83	49	1.319			
07-Sep-83	55	1.296			
15-Mar-84	61	1.296			
07-Sep-84	67	1.330			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

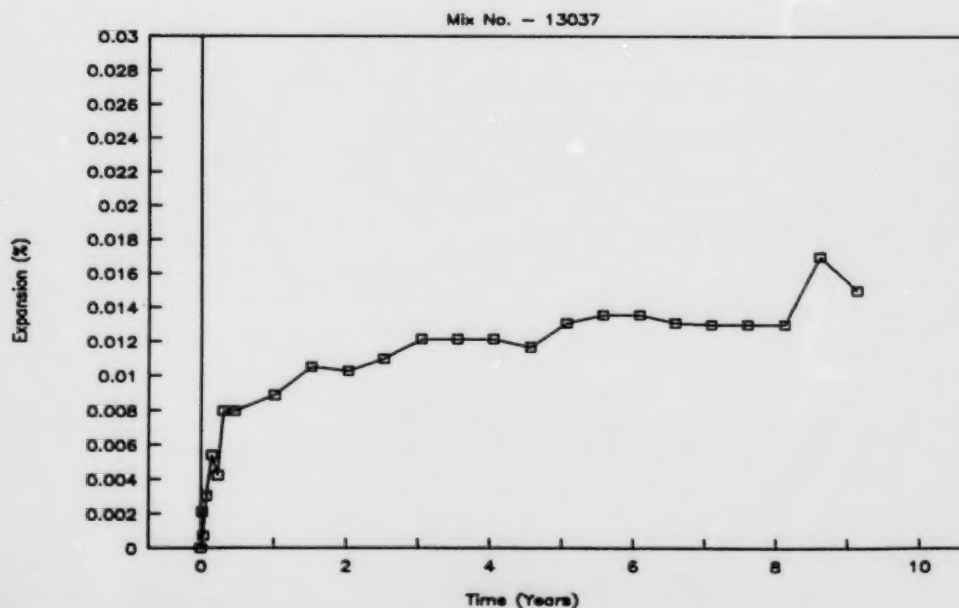
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	13037	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	R H SAUNDERS GS	Cement:	CL69317 LAB. STD. (ALK 1.17%)
Date Cast :	24-Sep-80		
Age (as of Jan 1/90) :	9 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	26-Sep-86	73	0.014
01-Oct-80	0.2	0.002	24-Mar-87	79	0.013
08-Oct-80	0.4	0.001	23-Sep-87	85	0.013
22-Oct-80	1	0.003	24-Mar-88	91	0.013
19-Nov-80	2	0.005	26-Sep-88	97	0.013
17-Dec-80	3	0.004	22-Mar-89	103	0.017
14-Jan-81	4	0.008	25-Sep-89	110	0.015
11-Mar-81	6	0.008			
25-Sep-81	12	0.009			
26-Mar-82	18	0.011			
24-Sep-82	24	0.010			
24-Mar-83	30	0.011			
28-Sep-83	37	0.012			
27-Mar-84	43	0.012			
24-Sep-84	49	0.012			
29-Mar-85	55	0.012			
24-Sep-85	61	0.013			
25-Mar-86	67	0.014			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

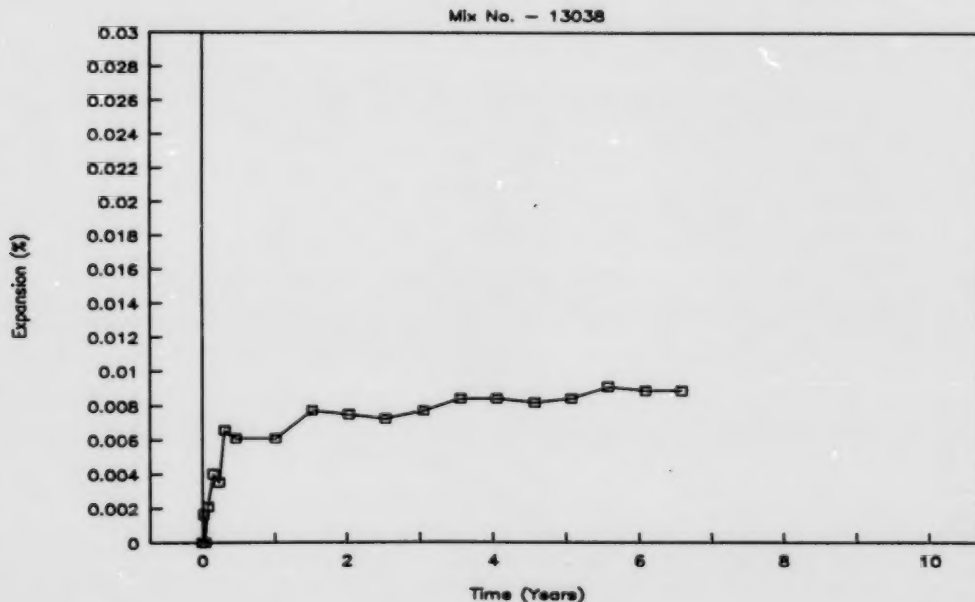
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13038 Fine Aggregate: S-4785 MANUFACTURED LIMESTONE SAND
 No. of Specimens : 3 Coarse Aggregate: S-4805 LIMESTONE CR RK
 Project : R H SAUNDERS GS Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 24-Sep-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	26-Sep-86	73	0.009
01-Oct-80	0.2	0.002	24-Mar-87	79	0.009
08-Oct-80	0.4	0.000	23-Sep-87	85	0.008
22-Oct-80	1	0.002	24-Mar-88	91	0.008
19-Nov-80	2	0.004	26-Sep-88	97	0.009
17-Dec-80	3	0.004	22-Mar-89	103	0.013
14-Jan-81	4	0.007	25-Sep-89	110	0.010
11-Mar-81	6	0.006			
25-Sep-81	12	0.006			
26-Mar-82	18	0.008			
24-Sep-82	24	0.007			
24-Mar-83	30	0.007			
28-Sep-83	37	0.008			
27-Mar-84	43	0.008			
24-Sep-84	49	0.008			
29-Mar-85	55	0.008			
24-Sep-85	61	0.008			
25-Mar-86	67	0.009			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

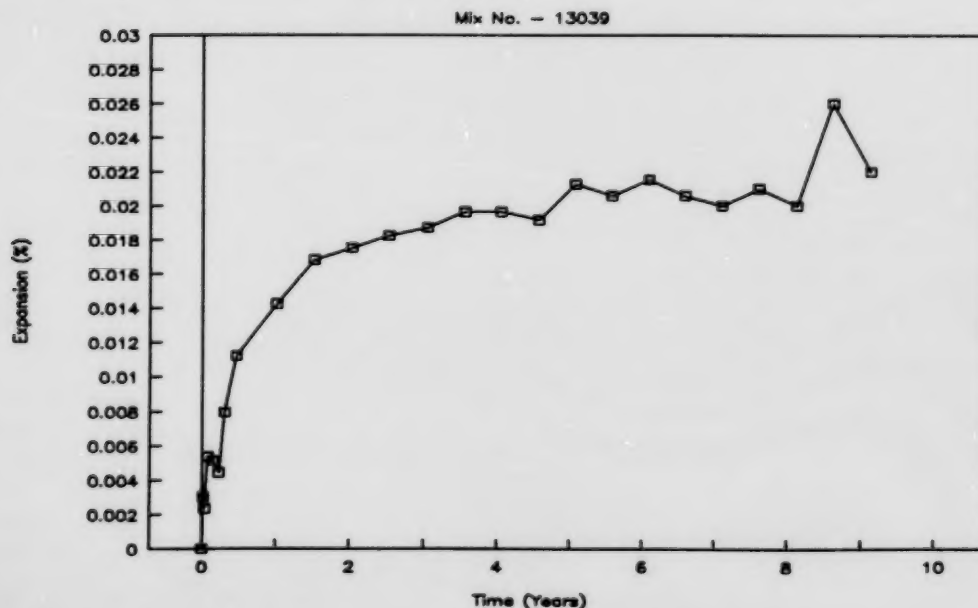
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13039 Fine Aggregate: S-7167 PARIS SAND
 No. of Specimens : 3 Coarse Aggregate: S-6790 BEAUHARNOIS
 Project : R H SAUNDERS GS Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 24-Sep-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	26-Sep-86	73	0.022
01-Oct-80	0.2	0.003	24-Mar-87	79	0.021
08-Oct-80	0.4	0.002	23-Sep-87	85	0.020
22-Oct-80	1	0.005	24-Mar-88	91	0.021
19-Nov-80	2	0.005	26-Sep-88	97	0.020
17-Dec-80	3	0.004	22-Mar-89	103	0.026
14-Jan-81	4	0.008	25-Sep-89	110	0.022
11-Mar-81	6	0.011			
25-Sep-81	12	0.014			
26-Mar-82	18	0.017			
24-Sep-82	24	0.018			
24-Mar-83	30	0.018			
28-Sep-83	37	0.019			
27-Mar-84	43	0.020			
24-Sep-84	49	0.020			
29-Mar-85	55	0.019			
24-Sep-85	61	0.021			
25-Mar-86	67	0.021			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

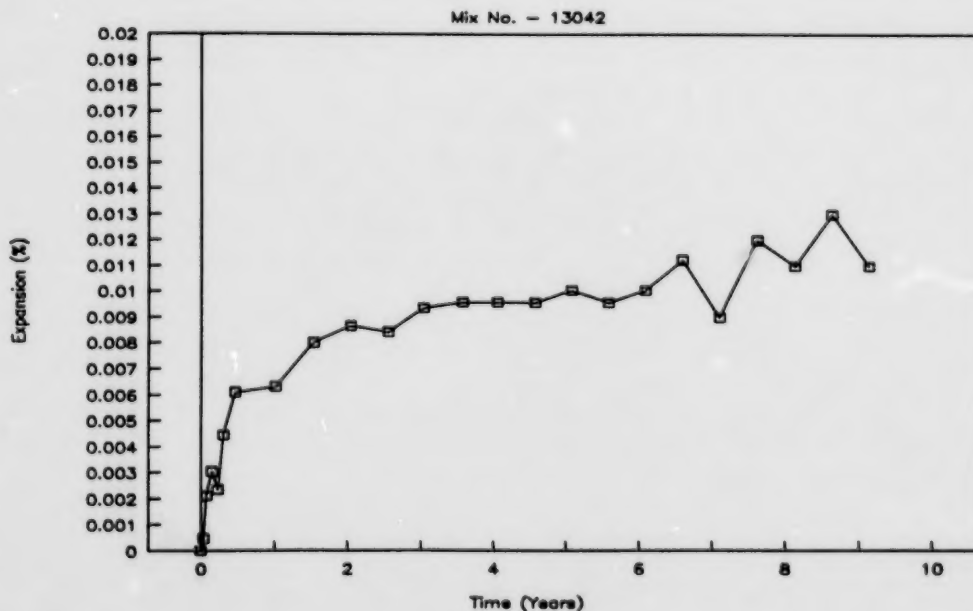
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13042 Fine Aggregate: S-7214 FLEETWOOD PIT
 No. of Specimens : 3 Coarse Aggregate: S-7215 FLEETWOOD PIT
 Project : DARLINGTON GS Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 01-Oct-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Oct-80	0.0	0.000	01-Oct-86	73	0.010
08-Oct-80	0.2	-0.002	01-Apr-87	79	0.011
15-Oct-80	0.4	0.000	01-Oct-87	85	0.009
29-Oct-80	1	0.002	01-Apr-88	91	0.012
26-Nov-80	2	0.003	03-Oct-88	97	0.011
24-Dec-80	3	0.002	03-Apr-89	104	0.013
21-Jan-81	4	0.004	02-Oct-89	110	0.011
18-Mar-81	6	0.006			
02-Oct-81	12	0.006			
05-Apr-82	18	0.008			
05-Oct-82	24	0.009			
07-Apr-83	31	0.008			
30-Sep-83	36	0.009			
10-Apr-84	43	0.010			
01-Oct-84	49	0.010			
04-Apr-85	55	0.010			
02-Oct-85	61	0.010			
01-Apr-86	67	0.010			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

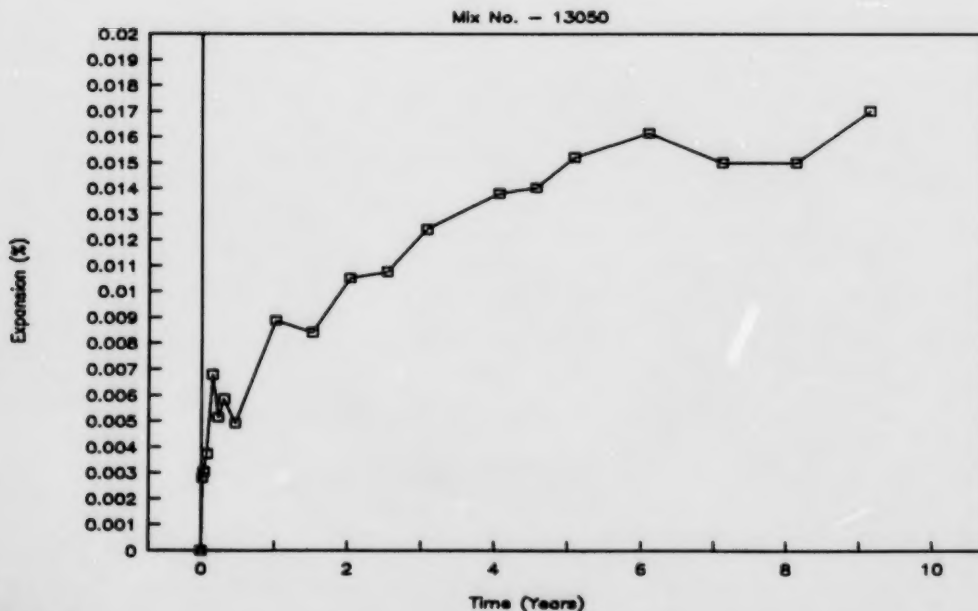
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13050 Fine Aggregate: S-7221 ATIKOKAN FDN
 No. of Specimens : 3 Coarse Aggregate: S-7219 & 7220 ATIKOKAN FDN
 Project : ATIKOKAN GS Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 25-Nov-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-Nov-80	0.0	0.000	25-Nov-88	97	0.015
02-Dec-80	0.2	0.003	24-Nov-89	110	0.017
09-Dec-80	0.4	0.003			
23-Dec-80	1	0.004			
19-Jan-81	2	0.007			
17-Feb-81	3	0.005			
17-Mar-81	4	0.006			
12-May-81	6	0.005			
26-Nov-81	12	0.009			
25-May-82	18	0.008			
25-Nov-82	24	0.011			
26-May-83	30	0.011			
05-Dec-83	37	0.012			
23-Nov-84	49	0.014			
24-May-85	55	0.014			
26-Nov-85	61	0.015			
25-Nov-86	73	0.016			
25-Nov-87	85	0.015			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

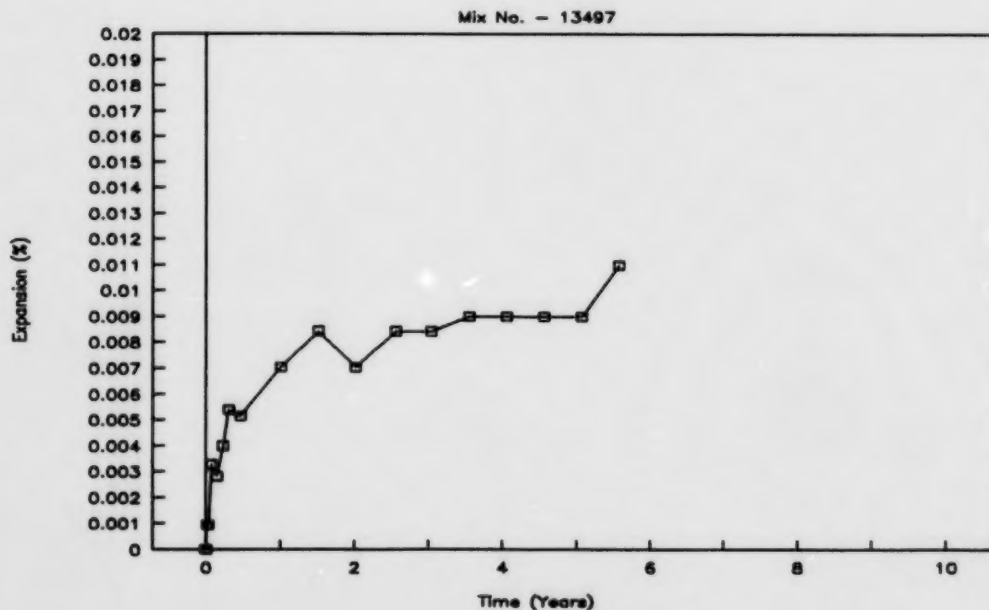
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13497 Fine Aggregate: S-7452 MTC PIT
 No. of Specimens : 3 Coarse Aggregate: S-7452 MTC PIT
 Project : RAT RAPIDS DAM Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 07-Jun-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Jun-84	0.0	0.000			
14-Jun-84	0.2	0.001			
21-Jun-84	0.4	0.001			
05-Jul-84	1	0.003			
02-Aug-84	2	0.003			
30-Aug-84	3	0.004			
27-Sep-84	4	0.005			
22-Nov-84	6	0.005			
07-Jun-85	12	0.007			
06-Dec-85	18	0.008			
06-Jun-86	24	0.007			
17-Dec-86	31	0.008			
08-Jun-87	37	0.008			
09-Dec-87	43	0.009			
07-Jun-88	49	0.009			
07-Dec-88	55	0.009			
07-Jun-89	61	0.009			
07-Dec-89	67	0.011			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

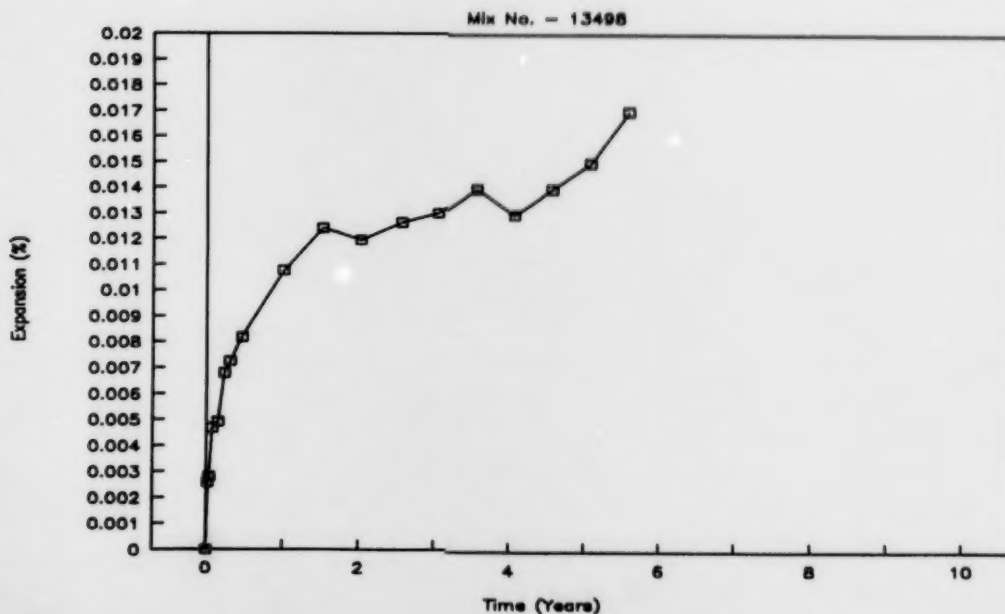
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13498 Fine Aggregate: S-7452 MTC PIT
 No. of Specimens : 3 Coarse Aggregate: S-7452 MTC PIT
 Project : RAT RAPIDS DAM Cement: CL70055 LAB. STD. (ALK 0.78%)
 Date Cast : 07-Jun-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
08-Jun-84	0.0	0.000			
14-Jun-84	0.2	0.003			
21-Jun-84	0.4	0.003			
05-Jul-84	1	0.005			
02-Aug-84	2	0.005			
30-Aug-84	3	0.007			
27-Sep-84	4	0.007			
22-Nov-84	6	0.008			
07-Jun-85	12	0.011			
06-Dec-85	18	0.012			
06-Jun-86	24	0.012			
17-Dec-86	31	0.013			
08-Jun-87	37	0.013			
09-Dec-87	43	0.014			
07-Jun-88	49	0.013			
07-Dec-88	55	0.014			
07-Jun-89	61	0.015			
07-Dec-89	67	0.017			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

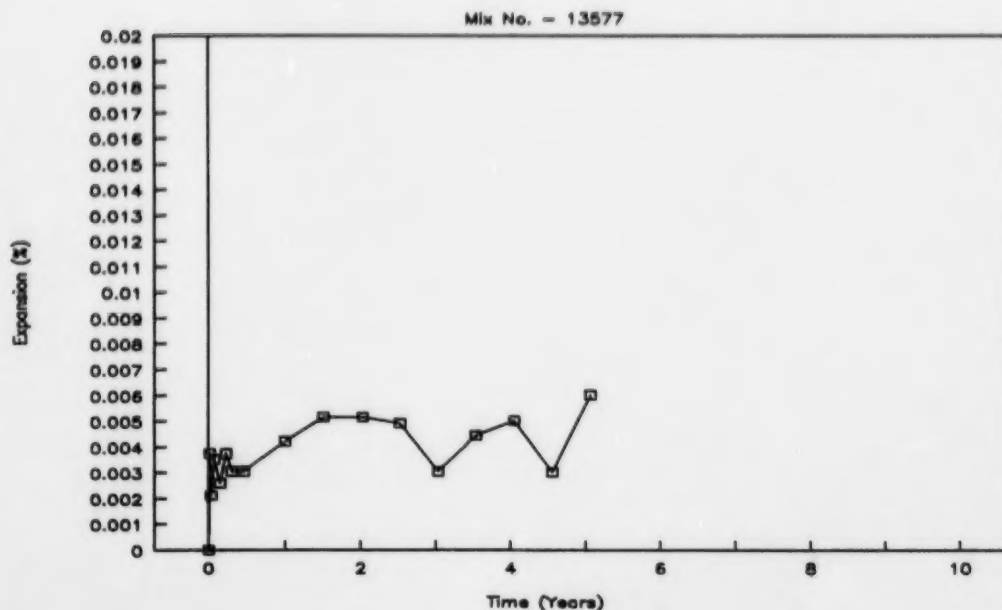
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13577 Fine Aggregate: S-7465 MTC PIT
 No. of Specimens : 3 Coarse Aggregate: S-7466 MTC PIT
 Project : RAT RAPIDS DAM Cement: CL70094 PROJECT
 Date Cast : 22-Nov-84
 Age (as of Jan 1/90) : 5 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Nov-84	0.0	0.000			
29-Nov-84	0.2	0.004			
06-Dec-84	0.4	0.002			
20-Dec-84	1	0.004			
17-Jan-85	2	0.003			
14-Feb-85	3	0.004			
14-Mar-85	4	0.003			
09-May-85	6	0.003			
21-Nov-85	12	0.004			
22-May-86	18	0.005			
26-Nov-86	24	0.005			
21-May-87	30	0.005			
20-Nov-87	36	0.003			
20-May-88	42	0.004			
22-Nov-88	49	0.005			
23-May-89	55	0.003			
23-Nov-89	61	0.006			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

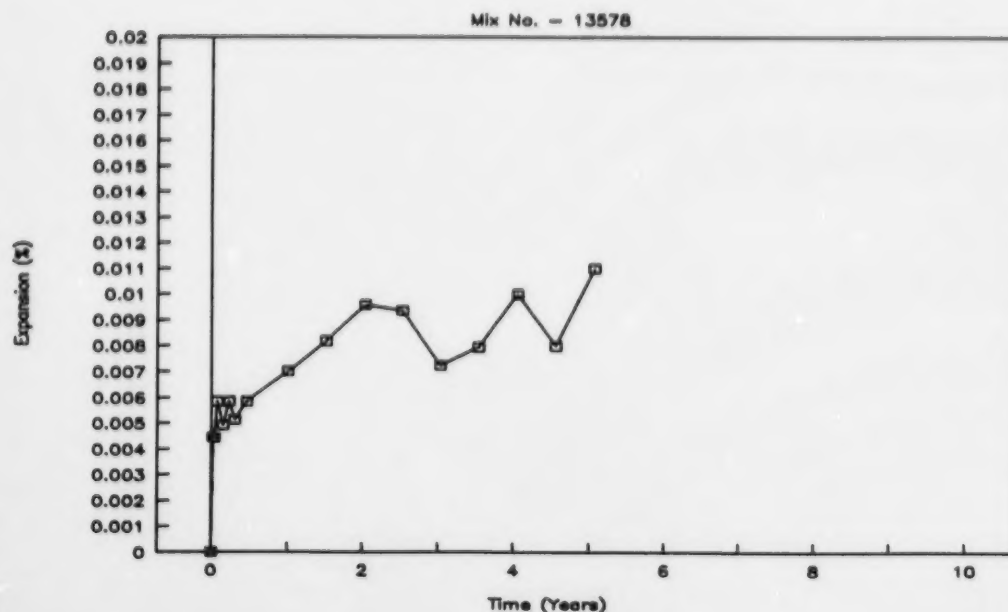
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13578 Fine Aggregate: S-7465 MTC PIT
 No. of Specimens : 3 Coarse Aggregate: S-7466 MTC PIT
 Project : RAT RAPIDS DAM Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 22-Nov-84
 Age (as of Jan 1/90) : 5 years
 Remarks : Specimens stored at 23 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Nov-84	0.0	0.000			
29-Nov-84	0.2	0.004			
06-Dec-84	0.4	0.004			
20-Dec-84	1	0.006			
17-Jan-85	2	0.005			
14-Feb-85	3	0.006			
14-Mar-85	4	0.005			
09-May-85	6	0.006			
21-Nov-85	12	0.007			
22-May-86	18	0.008			
26-Nov-86	24	0.010			
21-May-87	30	0.009			
20-Nov-87	36	0.007			
20-May-88	42	0.008			
22-Nov-88	49	0.010			
23-May-89	55	0.008			
22-Nov-89	61	0.011			



(CONCRETE PRISM EXPANSION METHOD)

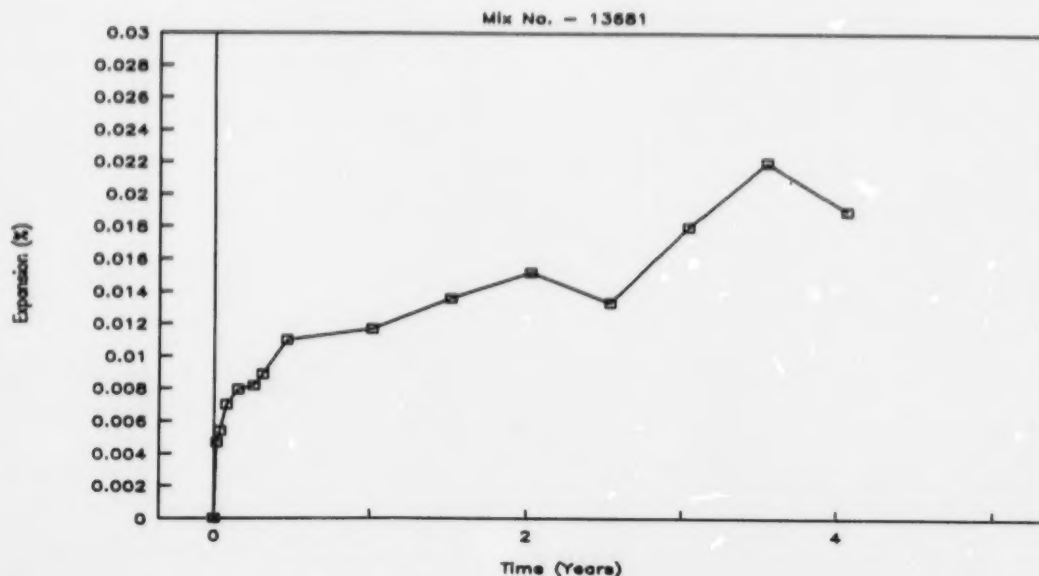
CSA CAN3-A23.2-14A

Mix No. : 13681
 No. of Specimens : 3
 Project : RAD. WASTE DISPOSAL
 Date Cast : 10-Sep-85
 Age (as of Jan 1/90) : 4 years
 Remarks : Specimens stored at 23 C

Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-6376 DUNDAS CR ST
 Cement: CL70146 TYPE 50 (ALK 0.72%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Sep-85	0.0	0.000			
17-Sep-85	0.2	0.005			
24-Sep-85	0.4	0.005			
08-Oct-85	1	0.007			
05-Nov-85	2	0.008			
11-Dec-85	3	0.008			
31-Dec-85	4	0.009			
25-Feb-86	6	0.011			
11-Sep-86	12	0.012			
10-Mar-87	18	0.014			
09-Sep-87	24	0.015			
10-Mar-88	30	0.013			
09-Sep-88	36	0.018			
10-Mar-89	43	0.022			
11-Sep-89	49	0.019			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

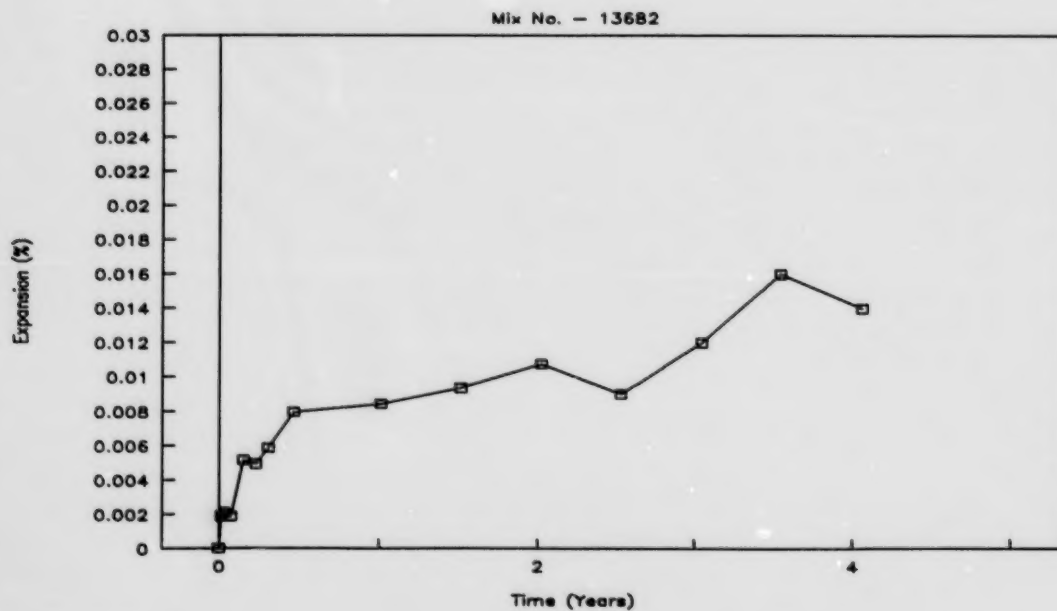
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	13682	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD. WASTE DISPOSAL	Cement:	CL70146 TYPE 50 (ALK 0.72%)
Date Cast :	18-Sep-85	Silica Fume:	10% CL70109 (ALK 0.74%)
Age (as of Jan 1/90) :	4 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
19-Sep-85	0.0	0.000			
25-Sep-85	0.2	0.002			
02-Oct-85	0.4	0.002			
16-Oct-85	1	0.002			
13-Nov-85	2	0.005			
11-Dec-85	3	0.005			
08-Jan-86	4	0.006			
05-Mar-86	6	0.008			
18-Sep-86	12	0.008			
18-Mar-87	18	0.009			
18-Sep-87	24	0.011			
18-Mar-88	30	0.009			
19-Sep-88	37	0.012			
17-Mar-89	43	0.016			
18-Sep-89	49	0.014			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

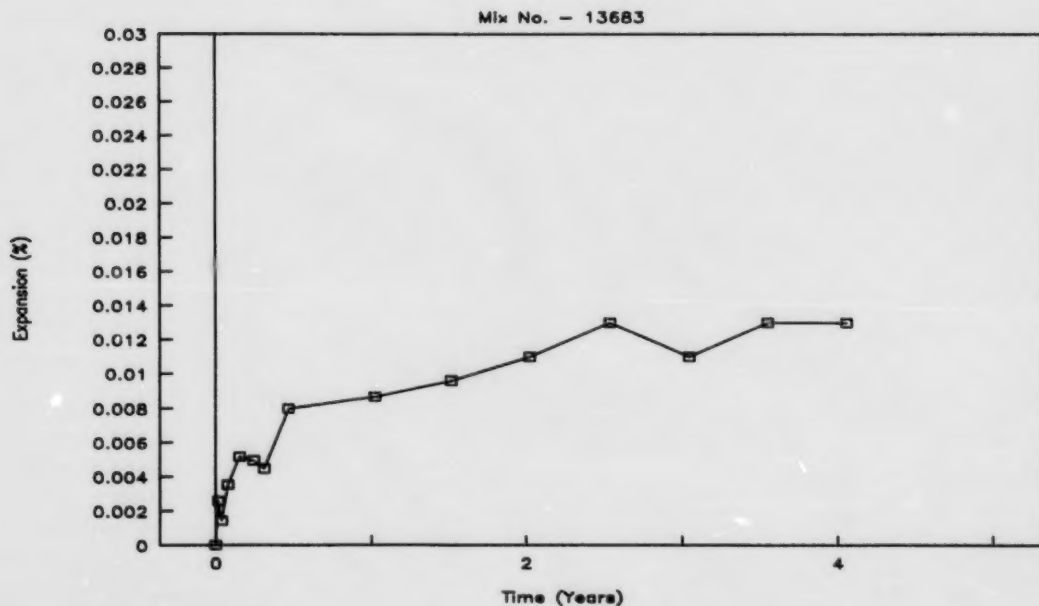
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	13683	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD. WASTE DISPOSAL	Cement:	CL70146 TYPE 50 (ALK 0.72%)
Date Cast :	03-Oct-85	Silica Fume:	15% CL70109 (ALK 0.74%)
Age (as of Jan 1/90) :	4 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Oct-85	0.0	0.000			
10-Oct-85	0.2	0.003			
17-Oct-85	0.4	0.001			
31-Oct-85	1	0.004			
28-Nov-85	2	0.005			
30-Dec-85	3	0.005			
23-Jan-86	4	0.004			
20-Mar-86	6	0.008			
08-Oct-86	12	0.009			
03-Apr-87	18	0.010			
02-Oct-87	24	0.011			
04-Apr-88	30	0.013			
04-Oct-88	37	0.011			
04-Apr-89	43	0.013			
03-Oct-89	49	0.013			



POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS

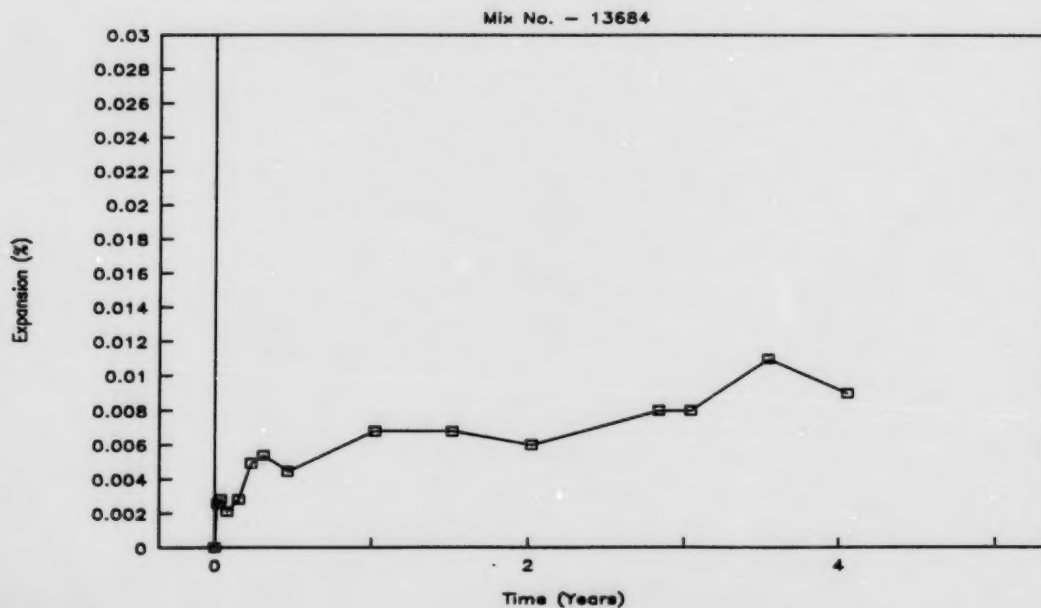
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	13684	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD. WASTE DISPOSAL	Cement:	CL70146 TYPE 50 (ALK 0.72%)
Date Cast :	10-Oct-85	Silica Fume:	20% CL70109 (ALK 0.74%)
Age (as of Jan 1/90) :	4 years		
Remarks :	Specimens stored at 23 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
11-Oct-85	0.0	0.000			
17-Oct-85	0.2	0.003			
24-Oct-85	0.4	0.003			
07-Nov-85	1	0.002			
05-Dec-85	2	0.003			
02-Jan-86	3	0.005			
30-Jan-86	4	0.005			
27-Mar-86	6	0.004			
14-Oct-86	12	0.007			
10-Apr-87	18	0.007			
09-Oct-87	24	0.006			
29-Jul-88	34	0.008			
11-Oct-88	37	0.008			
10-Apr-89	43	0.011			
10-Oct-89	49	0.009			



APPENDIX C

**POTENTIAL EXPANSIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)**

CSA CAN3-A23.2-14A

LONG-TERM TEST DATA

Specimens stored at 38°C



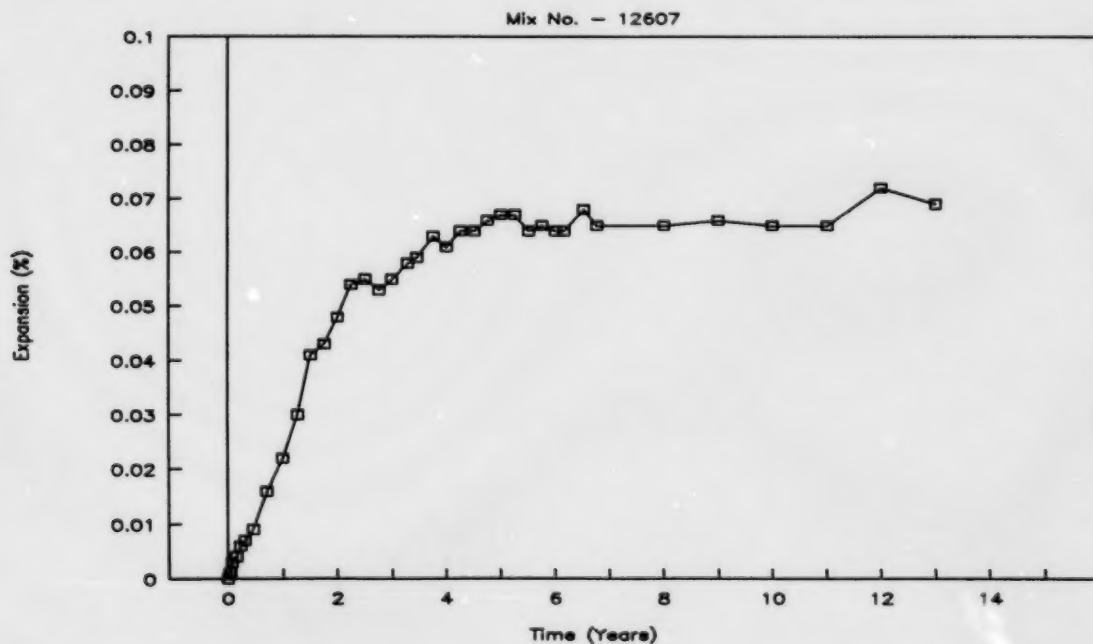
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12607 Fine Aggregate: S-6761 SPECULARITE
No. of Specimens : 1 Coarse Aggregate: S-6928 PANCAKE LAKE
Project : HIGH DENSITY AGGREGATES Cement: CL68764 LAB. STD. (ALK 1.04%)
Date Cast : 29-Mar-77
Age (as of Jan 1/90) : 13 years
Remarks : Specimens stored at 38 C
Numerous cracks at end of specimen (10-Jul-80)
Crack at end of specimen (29-Mar-90)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
30-Mar-77	0.0	0.000	28-Sep-79	30	0.055	27-May-83	74	0.064
05-Apr-77	0.0	0.000	02-Jan-80	33	0.053	07-Oct-83	78	0.068
12-Apr-77	0.5	0.001	28-Mar-80	36	0.055	04-Jan-84	81	0.065
26-Apr-77	1	0.003	10-Jul-80	39	0.058	29-Mar-85	96	0.065
25-May-77	2	0.004	10-Sep-80	41	0.059	27-Mar-86	108	0.066
21-Jun-77	3	0.006	30-Dec-80	45	0.063	27-Mar-87	120	0.065
19-Jul-77	4	0.007	27-Mar-81	48	0.061	29-Mar-88	132	0.065
13-Sep-77	6	0.009	30-Jun-81	51	0.064	29-Mar-89	144	0.072
13-Dec-77	9	0.016	02-Oct-81	54	0.064	29-Mar-90	156	0.069
29-Mar-78	12	0.022	31-Dec-81	57	0.066			
06-Jul-78	15	0.030	30-Mar-82	60	0.067			
29-Sep-78	18	0.041	30-Jun-82	63	0.067			
02-Jan-79	21	0.043	30-Sep-82	66	0.064			
29-Mar-79	24	0.048	29-Dec-82	69	0.065			
29-Jun-79	27	0.054	30-Mar-83	72	0.064			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

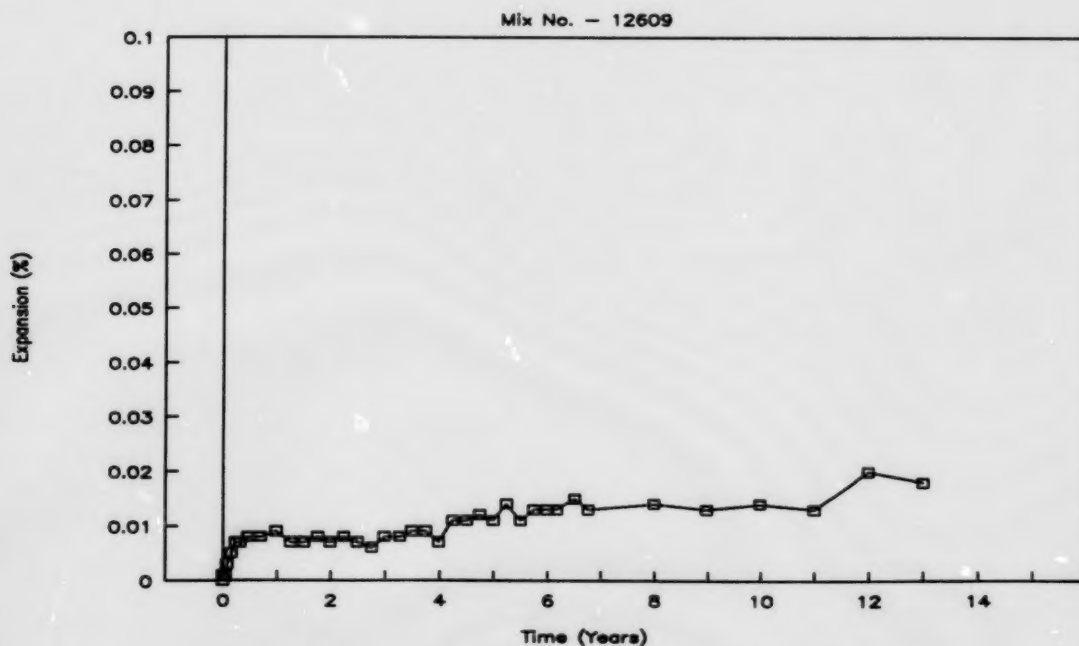
CSA CAN3-A23.2-14A

Mix No. : 12609
 No. of Specimens : 2
 Project : CONTROL
 Date Cast : 05-Apr-77
 Age (as of Jan 1/90) : 13 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-6608 PARIS SAND
 Coarse Aggregate: S-6437 PARIS CR GR
 Cement: CL68764 LAB. STD. (ALK 1.04%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
06-Apr-77	0.0	0.000	02-Jan-80	33	0.006	04-Jan-84	81	0.013
12-Apr-77	0.0	0.001	28-Mar-80	36	0.008	29-Mar-85	96	0.014
19-Apr-77	0.5	0.001	10-Jul-80	39	0.008	27-Mar-86	108	0.013
03-May-77	1	0.003	30-Sep-80	42	0.009	27-Mar-87	120	0.014
31-May-77	2	0.005	30-Dec-80	45	0.009	29-Mar-88	132	0.013
28-Jun-77	3	0.007	27-Mar-81	48	0.007	29-Mar-89	144	0.020
26-Jul-77	4	0.007	30-Jun-81	51	0.011	29-Mar-90	156	0.018
20-Sep-77	6	0.008	02-Oct-81	54	0.011			
13-Dec-77	8	0.008	31-Dec-81	57	0.012			
29-Mar-78	12	0.009	30-Mar-82	60	0.011			
06-Jul-78	15	0.007	30-Jun-82	63	0.014			
29-Sep-78	18	0.007	30-Sep-82	66	0.011			
03-Jan-79	21	0.008	29-Dec-82	69	0.013			
29-Mar-79	24	0.007	30-Mar-83	72	0.013			
29-Jun-79	27	0.008	03-Jun-83	74	0.013			
28-Sep-79	30	0.007	07-Oct-83	78	0.015			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

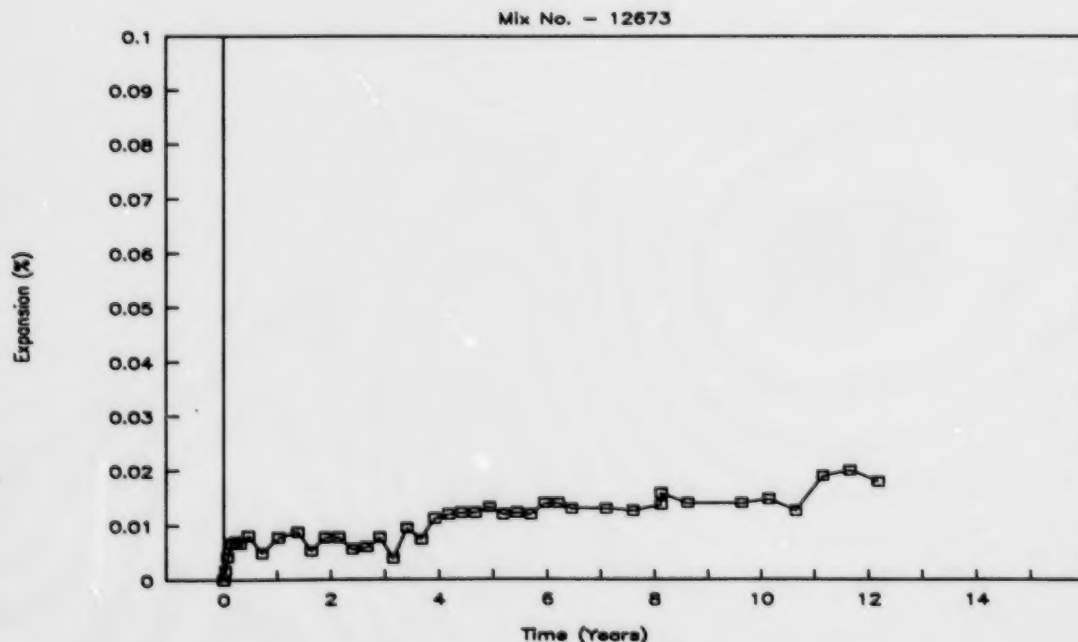
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12673 Fine Aggregate: S-6987 CHAPPELL PIT
 No. of Specimens : 2 Coarse Aggregate: S-6986 McVITTIE PIT
 Project : BRUCE GS "B" Cement: CL68764 LAB. STD. (ALK 1.04%)
 Date Cast : 08-Sep-77
 Age (as of Jan 1/90) : 12 years
 Remarks : Specimens stored at 38 C
 Boiling water added to container (18-Apr-79)

TEST DATA

Date	Age	Avg Exp	Date	Age	Avg Exp	Date	Age	Avg Exp
	(Months)	(%)		(Months)	(%)		(Months)	(%)
09-Sep-77	0.0	0.000	18-Jul-80	35	0.008	08-Mar-85	91	0.013
15-Sep-77	0.2	0.000	16-Oct-80	38	0.004	11-Sep-85	97	0.014
22-Sep-77	0.4	0.002	19-Jan-81	41	0.009	11-Sep-85	97	0.016
06-Oct-77	1	0.004	22-Apr-81	44	0.007	08-Mar-86	103	0.014
03-Nov-77	2	0.007	21-Jul-81	47	0.011	10-Mar-87	116	0.014
01-Dec-77	3	0.007	22-Oct-81	50	0.012	09-Sep-87	122	0.015
29-Dec-77	4	0.007	15-Jan-82	53	0.012	08-Mar-88	128	0.013
23-Feb-78	6	0.008	16-Apr-82	56	0.012	08-Sep-88	134	0.019
24-May-78	9	0.005	20-Jul-82	59	0.013	08-Mar-89	140	0.020
12-Sep-78	12	0.008	19-Oct-82	62	0.012	08-Sep-89	146	0.018
18-Jan-79	17	0.009	19-Jan-83	65	0.012			
18-Apr-79	20	0.005	19-Apr-83	68	0.012			
18-Jul-79	23	0.008	22-Jul-83	71	0.014			
18-Oct-79	26	0.008	20-Oct-83	74	0.014			
18-Jan-80	29	0.006	18-Jan-84	77	0.013			
22-Apr-80	32	0.006	07-Sep-84	85	0.013			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

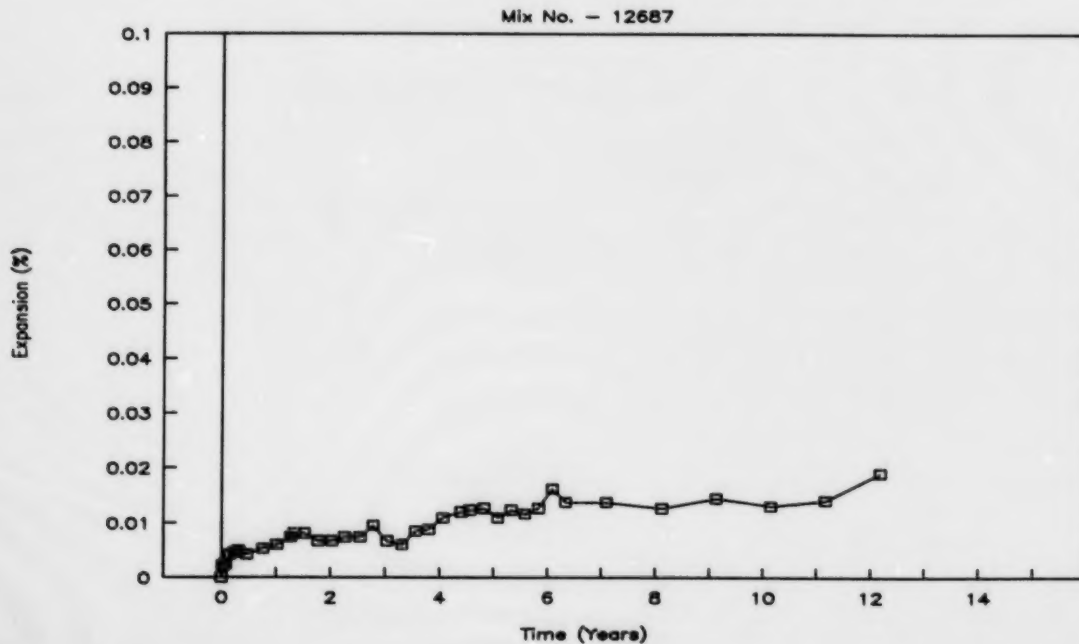
CSA CAN3-A23.2-14A

Mix No. : 12687
 No. of Specimens : 2
 Project : BRUCE GS "B"
 Date Cast : 20-Oct-77
 Age (as of Jan 1/90) : 12 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-6955 CHAPPELL PIT
 Coarse Aggregate: S-7002 McVITTIE PIT
 Cement: CL68764 LAB. STD. (ALK 1.04%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
21-Oct-77	0.0	0.000	22-Apr-80	30	0.007	18-Oct-84	85	0.014
28-Oct-77	0.2	0.002	18-Jul-80	33	0.009	22-Oct-85	97	0.013
03-Nov-77	0.4	0.002	16-Oct-80	36	0.007	22-Oct-86	110	0.014
17-Nov-77	1	0.002	23-Jan-81	40	0.006	21-Oct-87	122	0.013
15-Dec-77	2	0.004	22-Apr-81	43	0.008	22-Oct-88	134	0.014
12-Jan-78	3	0.005	22-Jul-81	46	0.009	21-Oct-89	146	0.019
09-Feb-78	4	0.005	22-Oct-81	49	0.011			
07-Apr-78	6	0.004	18-Feb-82	53	0.012			
20-Jul-78	9	0.005	20-Apr-82	55	0.012			
20-Oct-78	12	0.006	20-Jul-82	58	0.013			
19-Jan-79	15	0.007	19-Oct-82	61	0.011			
16-Feb-79	16	0.008	20-Jan-83	64	0.012			
20-Apr-79	18	0.008	21-Apr-83	67	0.012			
20-Jul-79	21	0.007	22-Jul-83	70	0.013			
19-Oct-79	24	0.007	21-Oct-83	73	0.016			
11-Jan-80	27	0.007	19-Jan-84	76	0.014			



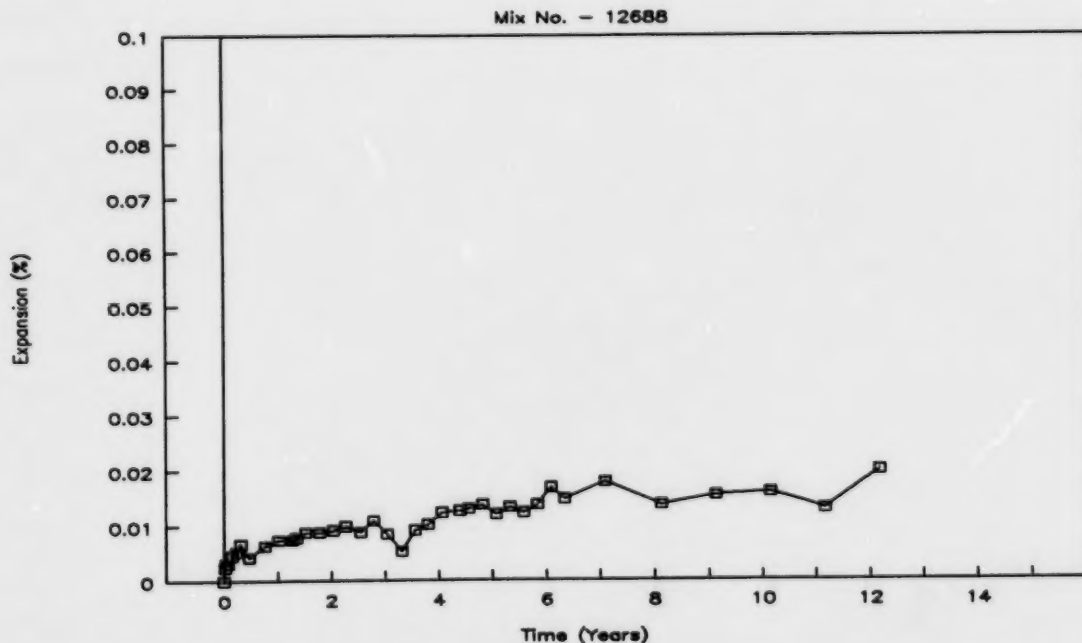
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12688	Fine Aggregate: S-6955 CHAPPELL PIT	
No. of Specimens : 2	Coarse Aggregate: S-7003 TARA	
Project : BRUCE GS "B"	Cement: CL68764 LAB. STD. (ALK 1.04%)	
Date Cast : 20-Oct-77		
Age (as of Jan 1/90) : 12 years		
Remarks : Specimens stored at 38 C		

TEST DATA

Date	Age	Avg Exp	Date	Age	Avg Exp	Date	Age	Avg Exp
	(Months)	(%)		(Months)	(%)		(Months)	(%)
21-Oct-77	0.0	0.000	22-Apr-80	30	0.009	18-Oct-84	85	0.018
28-Oct-77	0.2	0.002	18-Jul-80	33	0.011	22-Oct-85	97	0.014
03-Nov-77	0.4	0.003	16-Oct-80	36	0.008	22-Oct-86	110	0.015
17-Nov-77	1	0.003	23-Jan-81	40	0.005	21-Oct-87	122	0.016
15-Dec-77	2	0.005	22-Apr-81	43	0.009	22-Oct-88	134	0.013
12-Jan-78	3	0.005	22-Jul-81	46	0.010	21-Oct-89	146	0.020
09-Feb-78	4	0.007	22-Oct-81	49	0.012			
07-Apr-78	6	0.004	18-Feb-82	53	0.013			
20-Jul-78	9	0.006	20-Apr-82	55	0.013			
20-Oct-78	12	0.007	20-Jul-82	58	0.014			
19-Jan-79	15	0.007	19-Oct-82	61	0.012			
16-Feb-79	16	0.008	20-Jan-83	64	0.013			
20-Apr-79	18	0.009	21-Apr-83	67	0.012			
20-Jul-79	21	0.009	22-Jul-83	70	0.014			
19-Oct-79	24	0.009	21-Oct-83	73	0.017			
11-Jan-80	27	0.010	19-Jan-84	76	0.015			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

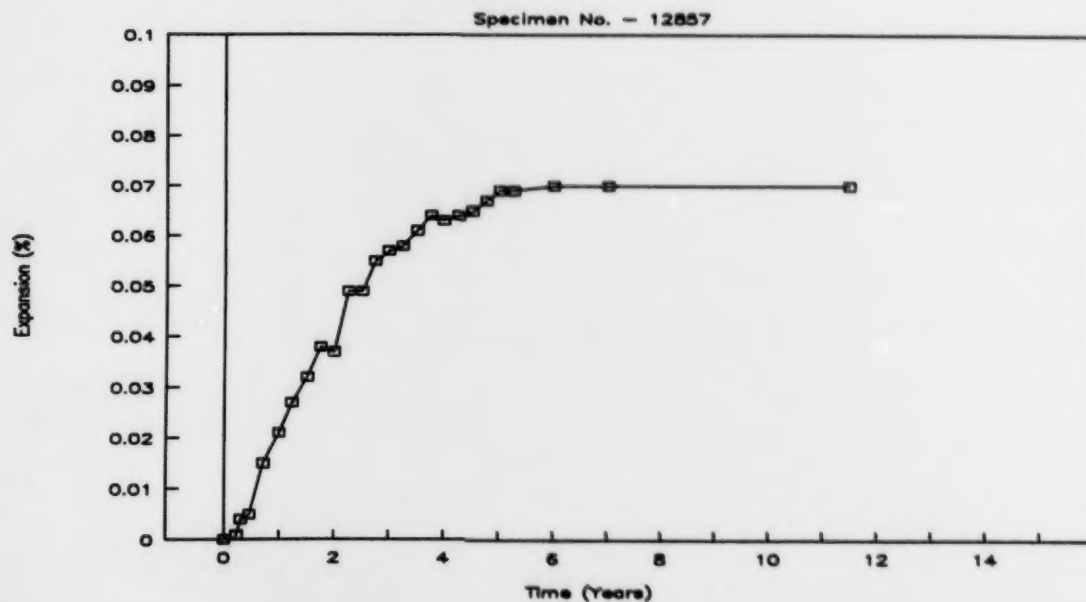
CSA CAN3-A23.2-14A

Mix No. : 12857
 No. of Specimens : 3
 Project : ATIKOKAN GS
 Date Cast : 19-Oct-78
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 38 C
 No readings were taken from 1986 to 1990

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7040 CR RK CORE
 Cement: CL68764 LAB. STD. (ALK 1.04%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
20-Oct-78	0.0	0.000	15-Jan-82	39	0.058
02-Nov-78	0.5	-0.003	20-Apr-82	42	0.061
16-Nov-78	1	-0.002	21-Jul-82	45	0.064
14-Dec-78	2	-0.001	15-Oct-82	48	0.063
11-Jan-79	3	0.001	20-Jan-83	51	0.064
08-Feb-79	4	0.004	21-Apr-83	54	0.065
05-Apr-79	6	0.005	22-Jul-83	57	0.067
05-Jul-79	9	0.015	20-Oct-83	60	0.069
19-Oct-79	12	0.021	19-Jan-84	63	0.069
11-Jan-80	15	0.027	18-Oct-84	72	0.070
22-Apr-80	18	0.032	18-Oct-85	84	0.070
18-Jul-80	21	0.038	06-Apr-90	138	0.070
16-Oct-80	24	0.037			
19-Jan-81	27	0.049			
22-Apr-81	30	0.049			
16-Jul-81	33	0.055			
16-Oct-81	36	0.057			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

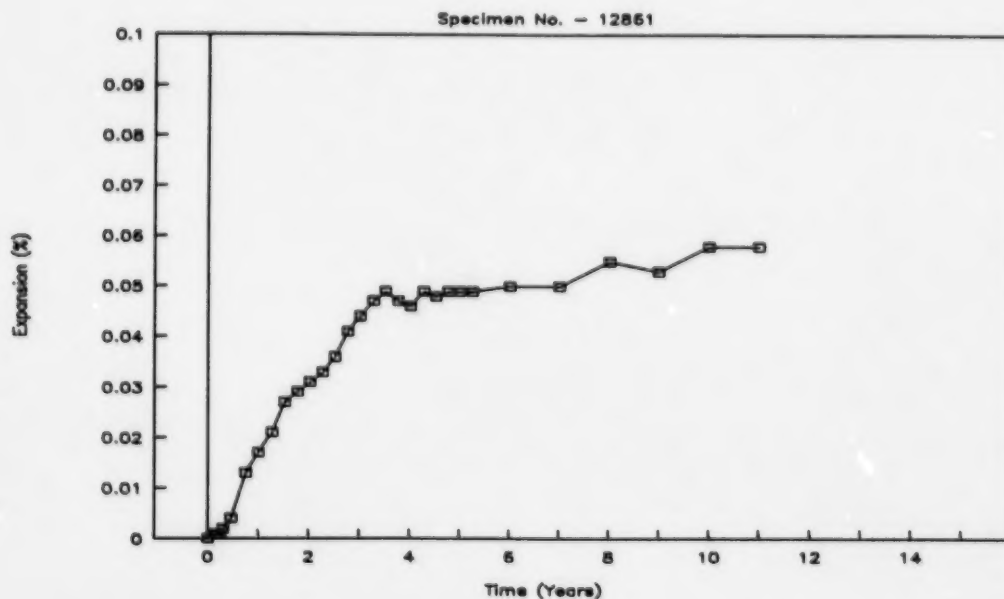
CSA CAN3-A23.2-14A

Mix No. : 12861
 No. of Specimens : 3
 Project : ATIKOKAN GS
 Date Cast : 21-Nov-78
 Age (as of Jan 1/90) : 11 years
 Remarks : Specimens stored at 38 C
 Boiling water added to container (16-Jan-79)

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7109 EXCAVATION RK
 Cement: CL68764 LAB. STD. (ALK 1.04%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
22-Nov-78	0.0	0.000	03-Mar-82	39	0.047
05-Dec-78	0.5	-0.002	28-May-82	42	0.049
19-Dec-78	1	-0.002	27-Aug-82	45	0.047
16-Jan-79	2	0.001	26-Nov-82	48	0.046
13-Feb-79	3	0.001	01-Mar-83	51	0.049
14-Mar-79	4	0.002	31-May-83	54	0.048
08-May-79	6	0.004	30-Aug-83	57	0.049
21-Aug-79	9	0.013	22-Nov-83	60	0.049
21-Nov-79	12	0.017	21-Feb-84	63	0.049
29-Feb-80	15	0.021	21-Nov-84	72	0.050
29-May-80	18	0.027	21-Nov-85	84	0.050
29-Aug-80	21	0.029	25-Nov-86	96	0.055
28-Nov-80	24	0.031	20-Nov-87	108	0.053
28-Feb-81	27	0.033	22-Nov-88	120	0.058
28-May-81	30	0.036	21-Nov-89	132	0.058
28-Aug-81	33	0.041			
27-Nov-81	36	0.044			



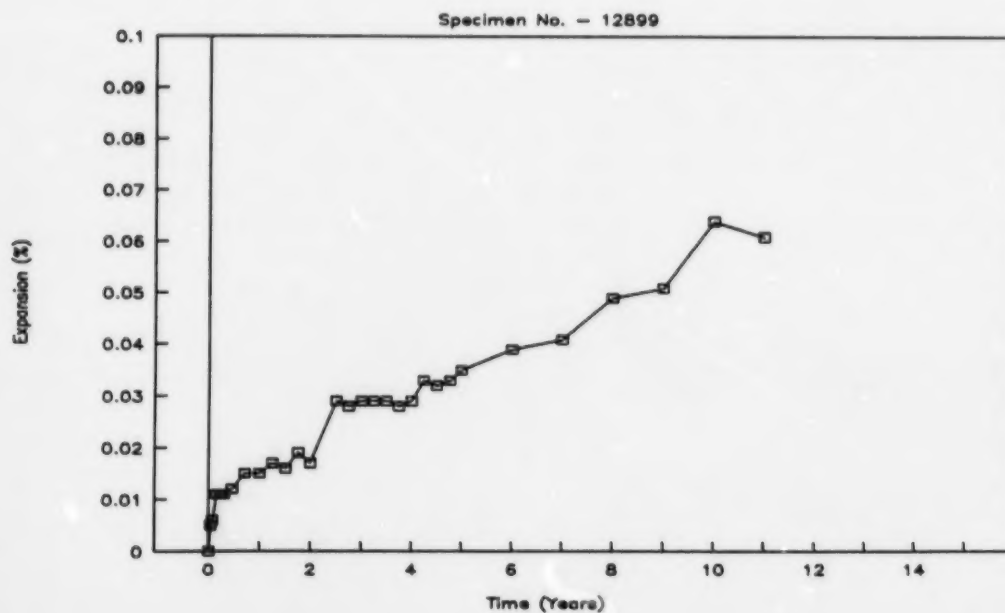
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 12899	Fine Aggregate: S-6854 PARIS SAND
No. of Specimens : 3	Coarse Aggregate: S-7115 FOUNDATION RK
Project : WESLEYVILLE GS	Cement: CL69317 LAB. STD. (ALK 1.17%)
Date Cast : 15-Mar-79	
Age (as of Jan 1/90) : 11 years	
Remarks : Specimens stored at 38 C	

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
16-Mar-79	0.0	0.000	15-Sep-82	42	0.029
29-Mar-79	0.5	0.005	15-Dec-82	45	0.028
12-Apr-79	1	0.006	17-Mar-83	48	0.029
10-May-79	2	0.011	15-Jun-83	51	0.033
07-Jun-79	3	0.011	15-Sep-83	54	0.032
05-Jul-79	4	0.011	21-Dec-83	57	0.033
30-Aug-79	6	0.012	15-Mar-84	60	0.035
30-Nov-79	9	0.015	15-Mar-85	72	0.039
14-Mar-80	12	0.015	14-Mar-86	84	0.041
17-Jun-80	15	0.017	13-Mar-87	96	0.049
17-Sep-80	18	0.016	15-Mar-88	108	0.051
16-Dec-80	21	0.019	15-Mar-89	120	0.064
13-Mar-81	24	0.017	15-Mar-90	132	0.061
17-Sep-81	30	0.029			
15-Dec-81	33	0.028			
16-Mar-82	36	0.029			
15-Jun-82	39	0.029			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

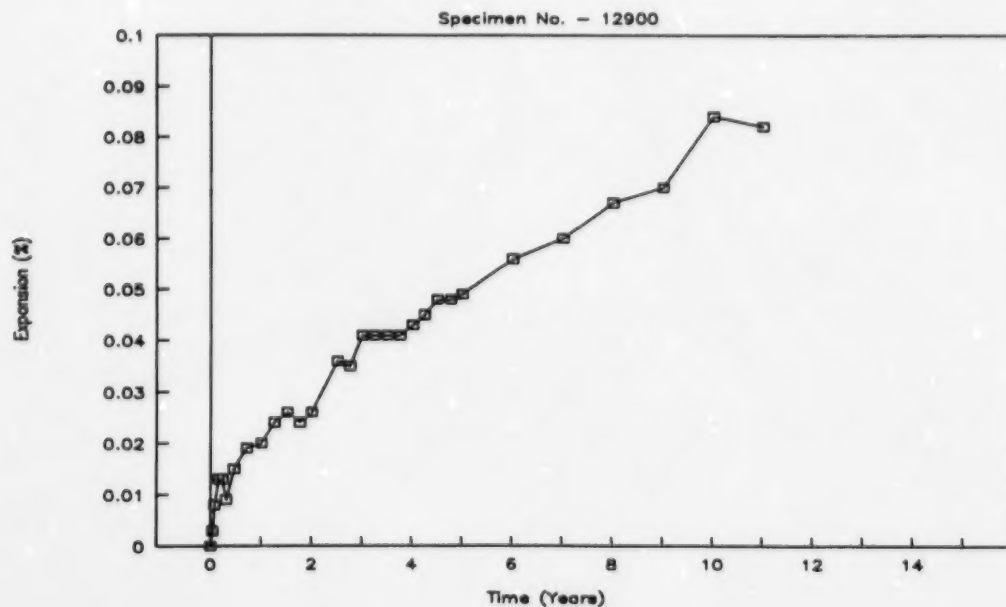
CSA CAN3-A23.2-14A

Mix No. : 12900
 No. of Specimens : 3
 Project : DARLINGTON GS
 Date Cast : 15-Mar-79
 Age (as of Jan 1/90) : 10 years
 Remarks : Specimens stored at 38 C
 Fine cracking on sides of specimen (15-Mar-90)

Fine Aggregate: S-6854 PARIS SAND
 Coarse Aggregate: S-7116 ST MARY'S CR ST
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
16-Mar-79	0.0	0.000	15-Sep-82	42	0.041
29-Mar-79	0.5	0.003	15-Dec-82	45	0.041
12-Apr-79	1	0.008	17-Mar-83	48	0.043
10-May-79	2	0.013	15-Jun-83	51	0.045
07-Jun-79	3	0.013	15-Sep-83	54	0.048
05-Jul-79	4	0.009	21-Dec-83	57	0.048
30-Aug-79	6	0.015	15-Mar-84	60	0.049
30-Nov-79	9	0.019	15-Mar-85	72	0.056
14-Mar-80	12	0.020	14-Mar-86	84	0.060
17-Jun-80	15	0.024	13-Mar-87	96	0.067
17-Sep-80	18	0.026	15-Mar-88	108	0.070
16-Dec-80	21	0.024	15-Mar-89	120	0.084
13-Mar-81	24	0.026	15-Mar-90	132	0.082
17-Sep-81	30	0.036	23-Mar-89	120	0.085
15-Dec-81	33	0.035	22-Sep-89	126	0.083
16-Mar-82	36	0.041	23-Mar-90	132	0.085
15-Jun-82	39	0.041			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

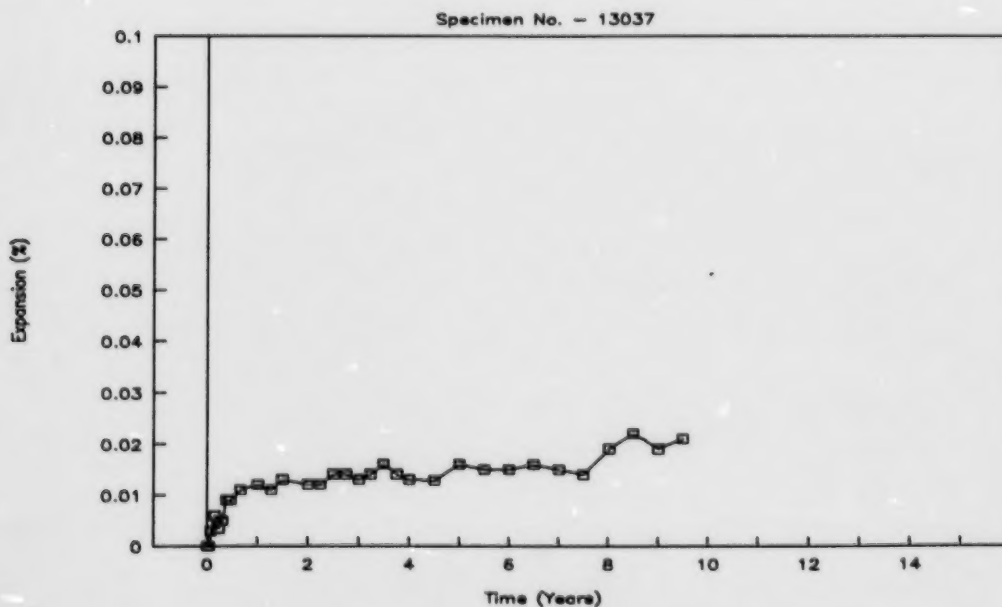
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. :	13037	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RH SAUNDERS GS	Cement:	CL69317 LAB. STD. (ALK 1.17%)
Date Cast :	24-Sep-80		
Age (as of Jan 1/90) :	9 years		
Remarks :	Specimens stored at 38 C		

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	21-Dec-83	39	0.014
08-Oct-80	0.5	0.000	23-Mar-84	42	0.016
22-Oct-80	1	0.003	26-Jun-84	45	0.014
19-Nov-80	2	0.006	25-Sep-84	48	0.013
17-Dec-80	3	0.004	26-Mar-85	54	0.013
14-Jan-81	4	0.005	24-Sep-85	60	0.016
11-Feb-81	5	0.009	25-Mar-86	66	0.015
11-Mar-81	6	0.009	24-Sep-86	72	0.015
25-May-81	8	0.011	24-Mar-87	78	0.016
25-Sep-81	12	0.012	25-Sep-87	84	0.015
29-Dec-81	15	0.011	24-Mar-88	90	0.014
24-Mar-82	18	0.013	27-Sep-88	96	0.019
23-Sep-82	24	0.012	23-Mar-89	102	0.022
23-Dec-82	27	0.012	22-Sep-89	108	0.019
24-Mar-83	30	0.014	23-Mar-90	114	0.021
24-Jun-83	33	0.014			
27-Sep-83	36	0.013			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

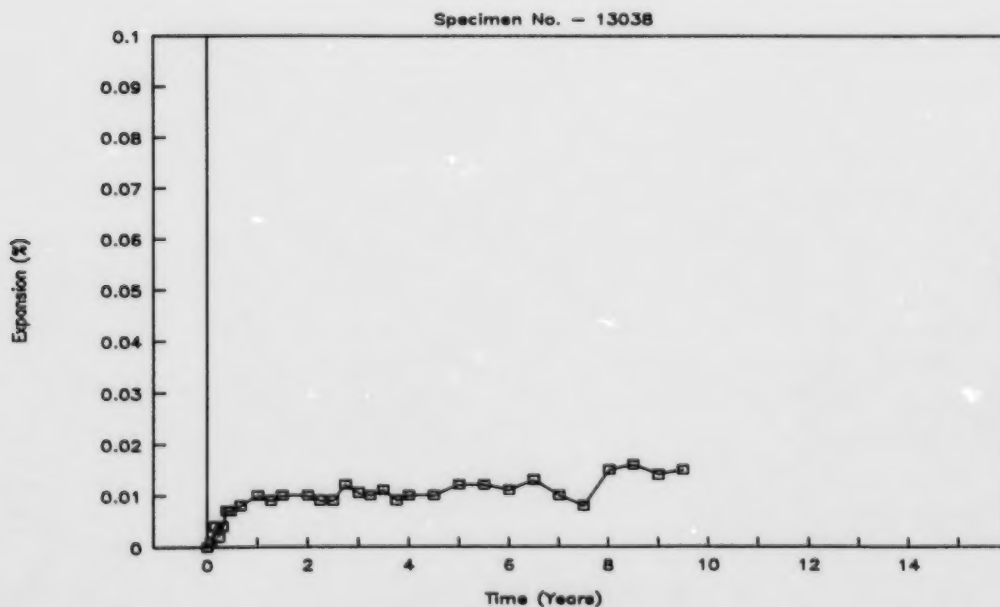
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13038 Fine Aggregate: S-4785 MANUF. LIMESTONE SAND
 No. of Specimens : 3 Coarse Aggregate: S-4805 LIMESTONE CR RK
 Project : RH SAUNDERS GS Cement: CL69317 LAB. STD. (ALK 1.17%)
 Date Cast : 24-Sep-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 38 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	21-Dec-83	39	0.010
08-Oct-80	0.5	-0.001	23-Mar-84	42	0.011
22-Oct-80	1	0.001	26-Jun-84	45	0.009
19-Nov-80	2	0.004	25-Sep-84	48	0.010
17-Dec-80	3	0.002	26-Mar-85	54	0.010
14-Jan-81	4	0.004	24-Sep-85	60	0.012
11-Feb-81	5	0.007	25-Mar-86	66	0.012
11-Mar-81	6	0.007	24-Sep-86	72	0.011
25-May-81	8	0.008	24-Mar-87	78	0.013
25-Sep-81	12	0.010	25-Sep-87	84	0.010
29-Dec-81	15	0.009	24-Mar-88	90	0.008
24-Mar-82	18	0.010	27-Sep-88	96	0.015
23-Sep-82	24	0.010	23-Mar-89	102	0.016
23-Dec-82	27	0.009	22-Sep-89	108	0.014
24-Mar-83	30	0.009	23-Mar-90	114	0.015
24-Jun-83	33	0.012			
27-Sep-83	36	0.011			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

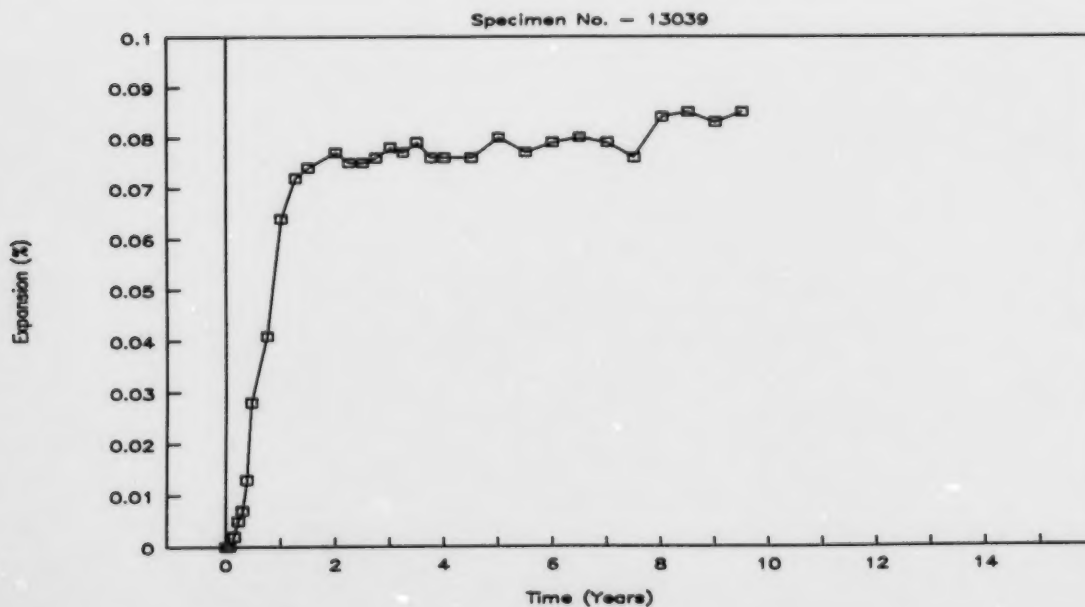
CSA CAN3-A23.2-14A

Mix No. : 13039
 No. of Specimens : 3
 Project : RH SAUNDERS GS
 Date Cast : 24-Sep-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 38 C
 Cracks developed at end of one specimen (25-Jun-81)
 White stains along specimens (22-Sep-89)

Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-6790 BEAUHARNOIS
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
25-Sep-80	0.0	0.000	27-Sep-83	36	0.078
08-Oct-80	0.5	0.000	21-Dec-83	39	0.077
22-Oct-80	1	0.000	23-Mar-84	42	0.079
19-Nov-80	2	0.002	26-Jun-84	45	0.076
17-Dec-80	3	0.005	25-Sep-84	48	0.076
14-Jan-81	4	0.007	26-Mar-85	54	0.076
11-Feb-81	5	0.013	24-Sep-85	60	0.080
11-Mar-81	6	0.028	25-Mar-86	66	0.077
25-Jun-81	9	0.041	24-Sep-86	72	0.079
25-Sep-81	12	0.064	24-Mar-87	78	0.080
29-Dec-81	15	0.072	25-Sep-87	84	0.079
24-Mar-82	18	0.074	24-Mar-88	90	0.076
24-Sep-82	24	0.077	27-Sep-88	96	0.084
23-Dec-82	27	0.075	23-Mar-89	102	0.085
24-Mar-83	30	0.075	22-Sep-89	108	0.083
24-Jun-83	33	0.076	23-Mar-90	114	0.085



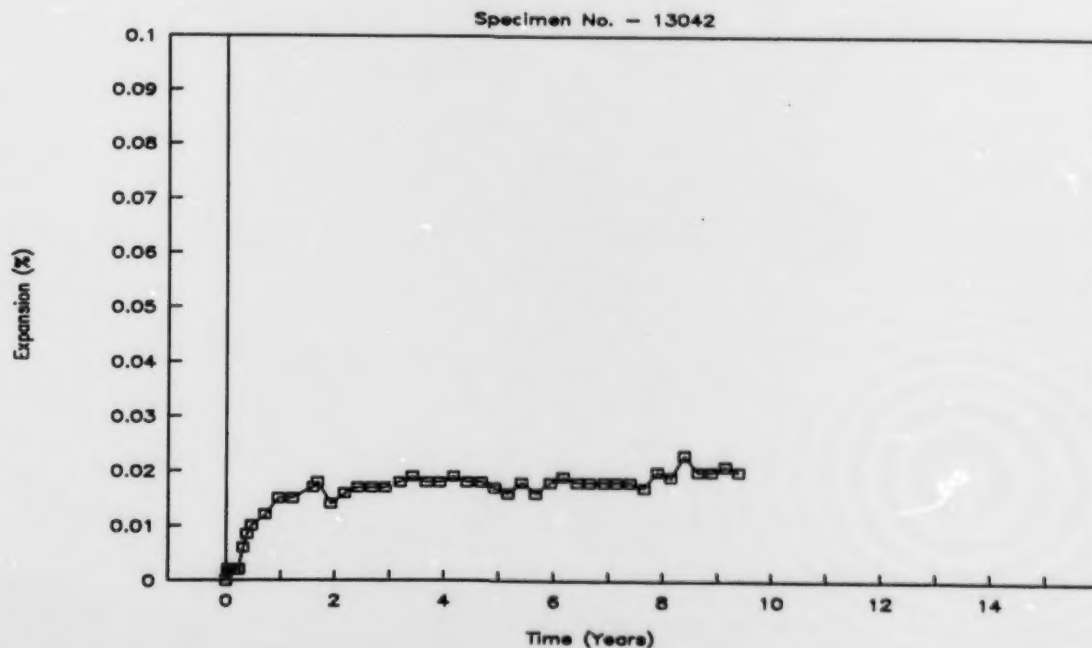
POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS
(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13042 Fine Aggregate: S-7214 FLEETWOOD
No. of Specimens : 3 Coarse Aggregate: S-7215 FLEETWOOD
Project : DARLINGTON GS Cement: CL69317 LAB. STD. (ALK 1.17%)
Date Cast : 01-Oct-80
Age (as of Jan 1/90) : 9 years
Remarks : Specimens stored at 38 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
02-Oct-80	0.0	0.000	02-Sep-83	35	0.017	20-Nov-87	86	0.018
15-Oct-80	0.5	0.002	09-Dec-83	38	0.018	19-Feb-88	89	0.018
29-Oct-80	1	0.002	01-Mar-84	41	0.019	20-May-88	92	0.017
26-Nov-80	2	0.002	01-Jun-84	44	0.018	19-Aug-88	95	0.020
24-Dec-80	3	0.002	31-Aug-84	47	0.018	18-Nov-88	98	0.019
21-Jan-81	4	0.006	30-Nov-84	50	0.019	17-Feb-89	101	0.023
18-Feb-81	5	0.008	01-Mar-85	53	0.018	17-May-89	104	0.020
18-Mar-81	6	0.010	04-Jun-85	56	0.018	17-Aug-89	107	0.020
16-Jun-81	8	0.012	30-Aug-85	59	0.017	17-Nov-89	110	0.021
16-Sep-81	12	0.015	29-Nov-85	62	0.016	16-Feb-90	113	0.020
16-Dec-81	14	0.015	28-Feb-86	65	0.018			
03-May-82	19	0.017	30-May-86	68	0.016			
01-Jun-82	20	0.018	04-Sep-86	71	0.018			
01-Sep-82	23	0.014	28-Nov-86	74	0.019			
01-Dec-82	26	0.016	03-Mar-87	77	0.018			
01-Mar-83	29	0.017	22-May-87	80	0.018			
03-Jun-83	32	0.017	25-Aug-87	83	0.018			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

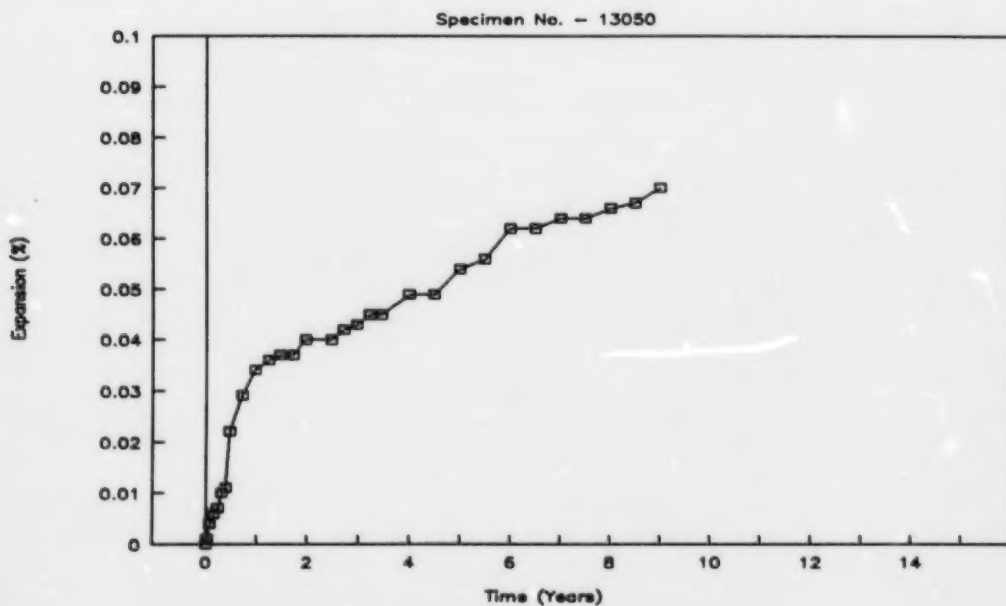
CSA CAN3-A23.2-14A

Mix No. : 13050
 No. of Specimens : 3
 Project : ATIKOKAN GS
 Date Cast : 25-Nov-80
 Age (as of Jan 1/90) : 9 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-7221 ATIKOKAN
 Coarse Aggregate: S-7219&7220 ATIKOKAN CR ST
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
26-Nov-80	0.0	0.000	12-Feb-84	39	0.045
02-Dec-80	0.2	0.001	11-May-84	42	0.045
23-Dec-80	1	0.004	23-Nov-84	48	0.049
20-Jan-81	2	0.006	24-May-85	54	0.049
17-Feb-81	3	0.007	26-Nov-85	60	0.054
17-Mar-81	4	0.010	23-May-86	66	0.056
14-Apr-81	5	0.011	25-Nov-86	72	0.062
12-May-81	6	0.022	26-May-87	78	0.062
12-Aug-81	9	0.029	25-Nov-87	84	0.064
12-Nov-81	12	0.034	25-May-88	90	0.064
18-Feb-82	15	0.036	25-Nov-88	96	0.066
12-May-82	18	0.037	24-May-89	102	0.067
12-Aug-82	21	0.037	24-Nov-89	108	0.070
11-Nov-82	24	0.040			
17-May-83	30	0.040			
12-Aug-83	33	0.042			
15-Nov-83	36	0.043			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

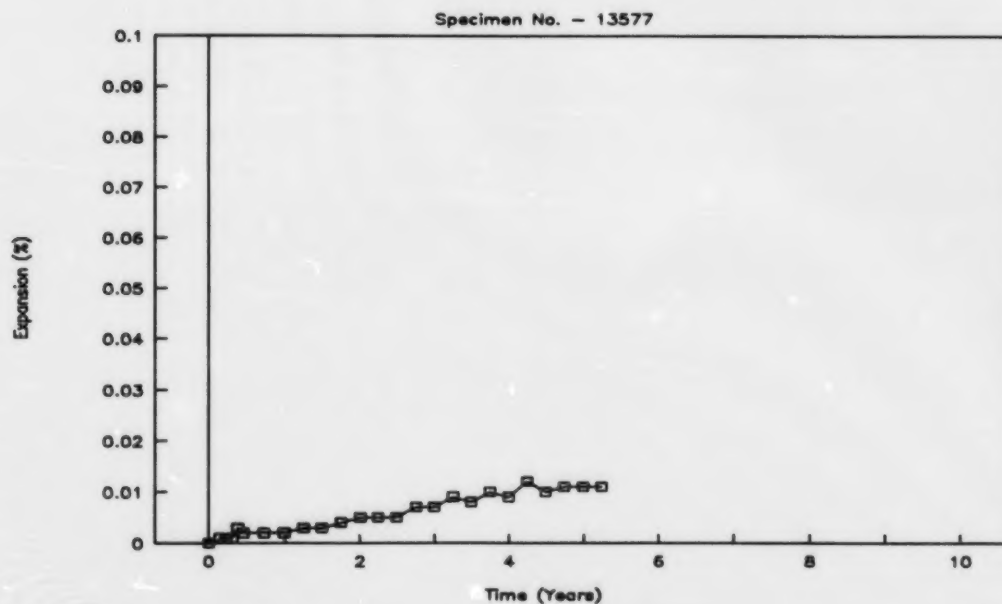
CSA CAN3-A23.2-14A

Mix No. : 13577
 No. of Specimens : 3
 Project : RAT RAPIDS DAM
 Date Cast : 22-Nov-84
 Age (as of Jan 1/90) : 5 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-7465 PROJECT
 Coarse Aggregate: S-7466 EXCAVATED RK
 Cement: CL70094 LAB. STD. PROJECT

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Nov-84	0.0	0.000	20-Nov-87	36	0.007
06-Dec-84	0.5	-0.003	19-Feb-88	39	0.009
20-Dec-84	1	-0.001	20-May-88	42	0.008
17-Jan-85	2	0.001	19-Aug-88	45	0.010
14-Feb-85	3	0.001	18-Nov-88	48	0.009
14-Mar-85	4	0.001	17-Feb-89	51	0.012
11-Apr-85	5	0.003	17-May-89	54	0.010
09-May-85	6	0.002	17-Aug-89	57	0.011
15-Aug-85	9	0.002	17-Nov-89	60	0.011
21-Nov-85	12	0.002	16-Feb-90	63	0.011
21-Feb-86	15	0.003			
22-May-86	18	0.003			
22-Aug-86	21	0.004			
25-Nov-86	24	0.005			
20-Feb-87	27	0.005			
21-May-87	30	0.005			
25-Aug-87	33	0.007			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

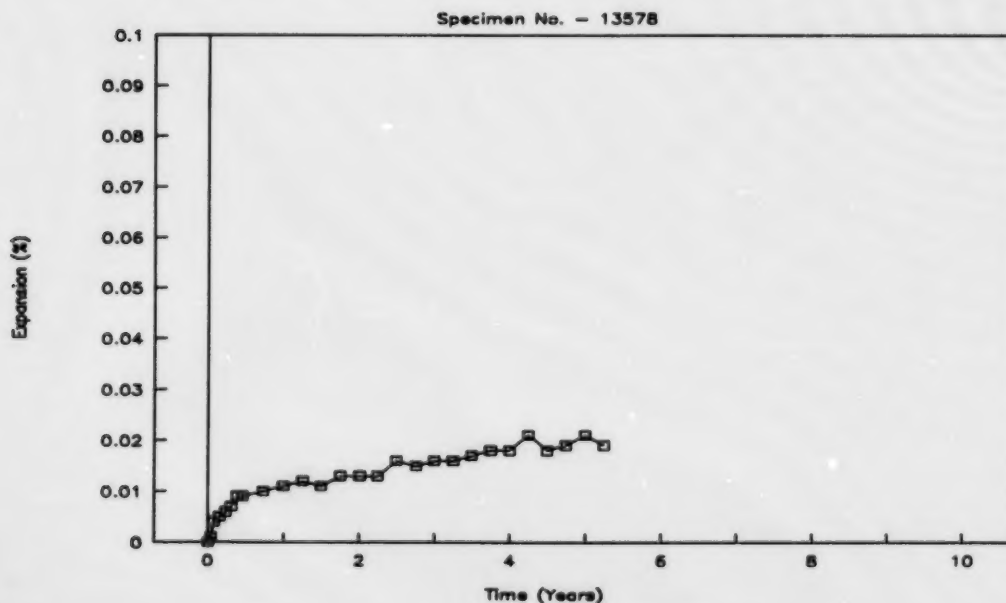
CSA CAN3-A23.2-14A

Mix No. : 13578
 No. of Specimens : 3
 Project : RAT RAPIDS DAM
 Date Cast : 22-Nov-84
 Age (as of Jan 1/90) : 5 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-7465 PROJECT
 Coarse Aggregate: S-7466 EXCAVATED RK
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
23-Nov-84	0.0	0.000	20-Nov-87	36	0.016
06-Dec-84	0.5	0.001	19-Feb-88	39	0.016
20-Dec-84	1	0.004	20-May-88	42	0.017
17-Jan-85	2	0.005	19-Aug-88	45	0.018
14-Feb-85	3	0.006	18-Nov-88	48	0.018
14-Mar-85	4	0.007	17-Feb-89	51	0.021
11-Apr-85	5	0.009	17-May-89	54	0.018
09-May-85	6	0.009	17-Aug-89	57	0.019
15-Aug-85	9	0.010	17-Nov-89	60	0.021
21-Nov-85	12	0.011	16-Feb-90	63	0.019
21-Feb-86	15	0.012			
22-May-86	18	0.011			
22-Aug-86	21	0.013			
25-Nov-86	24	0.013			
20-Feb-87	27	0.013			
21-May-87	30	0.016			
25-Aug-87	33	0.015			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

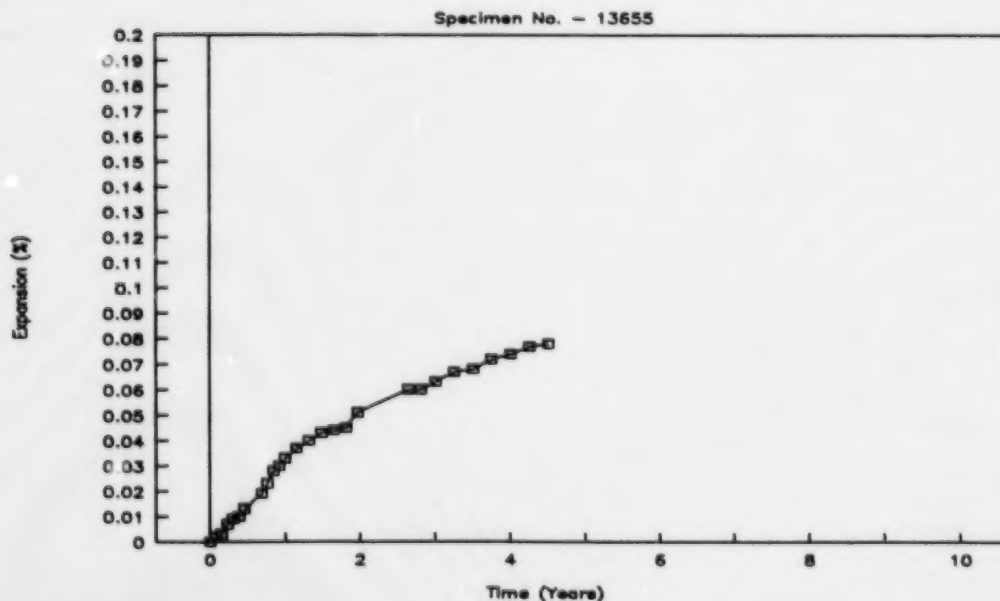
CSA CAN3-A23.2-14A

Mix No. : 13655
 No. of Specimens : 3
 Project : MACTAQUAC GS
 Date Cast : 03-Jul-85
 Age (as of Jan 1/90) : 4 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-7487 N.B. CR RK
 Cement: CL69317 LAB. STD. (ALK 1.17%)

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Jul-85	0.0	0.000	28-Apr-87	22	0.045
17-Jul-85	0.5	-0.001	23-Jun-87	24	0.051
31-Jul-85	1	0.002	25-Feb-88	32	0.060
28-Aug-85	2	0.003	27-Apr-88	34	0.060
25-Sep-85	3	0.007	05-Jul-88	36	0.063
23-Oct-85	4	0.009	04-Oct-88	39	0.067
20-Nov-85	5	0.010	04-Jan-89	42	0.068
18-Dec-85	6	0.013	04-Apr-89	45	0.072
11-Mar-86	8	0.019	05-Jul-89	48	0.074
08-Apr-86	9	0.023	04-Oct-89	51	0.077
07-May-86	10	0.028	04-Jan-90	54	0.078
03-Jun-86	11	0.030			
03-Jul-86	12	0.033			
28-Aug-86	14	0.037			
28-Oct-86	16	0.040			
30-Dec-86	18	0.043			
27-Feb-87	20	0.044			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

CSA CAN3-A23.2-14A

Mix No. : 13656

Fine Aggregate: S-7492 N.B. SAND

No. of Specimens : 3

Coarse Aggregate: S-7487 N.B. CR RK

Project : MACTAQUAC GS

Cement: CL69317 LAB. STD. (ALK 1.17%)

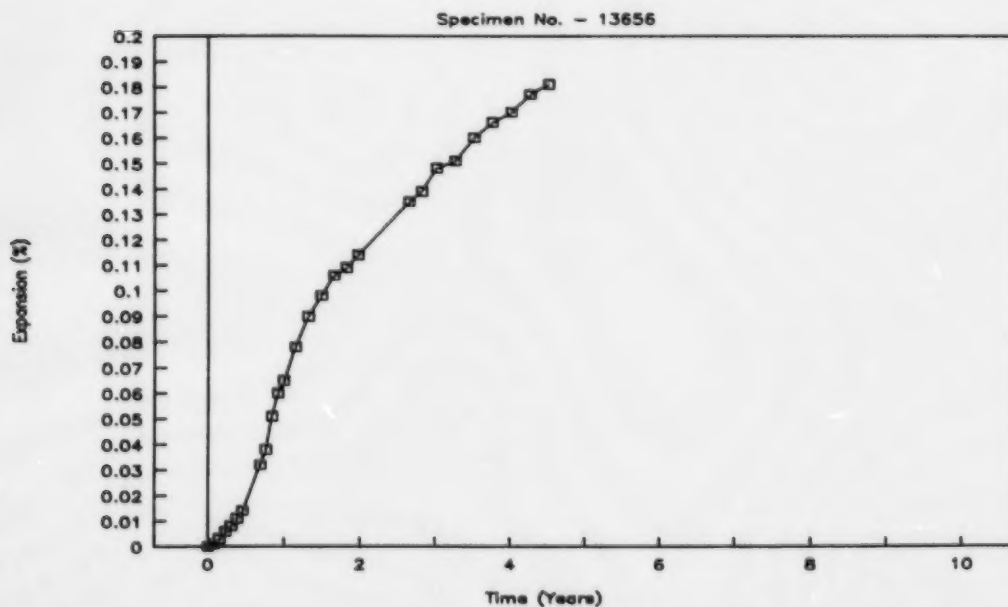
Date Cast : 03-Jul-85

Age (as of Jan 1/90) : 4 years

Remarks : Specimens stored at 38 C

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Jul-85	0.0	0.000	28-Apr-87	22	0.109
17-Jul-85	0.5	-0.002	23-Jun-87	24	0.114
31-Jul-85	1	0.001	25-Feb-88	32	0.135
28-Aug-85	2	0.003	27-Apr-88	34	0.139
25-Sep-85	3	0.006	05-Jul-88	36	0.148
23-Oct-85	4	0.008	04-Oct-88	39	0.151
20-Nov-85	5	0.011	04-Jan-89	42	0.160
18-Dec-85	6	0.014	04-Apr-89	45	0.166
11-Mar-86	8	0.032	05-Jul-89	48	0.170
08-Apr-86	9	0.038	04-Oct-89	51	0.177
07-May-86	10	0.051	04-Jan-90	54	0.181
03-Jun-86	11	0.060			
03-Jul-86	12	0.065			
28-Aug-86	14	0.078			
28-Oct-86	16	0.090			
30-Dec-86	18	0.098			
27-Feb-87	20	0.106			



POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS

(CONCRETE PRISM EXPANSION METHOD)

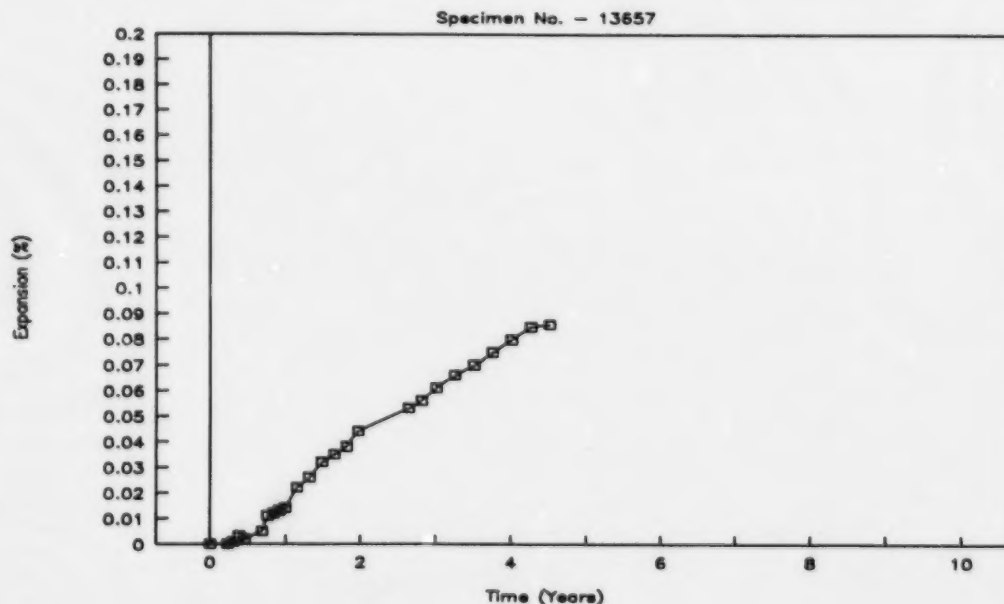
CSA CAN3-A23.2-14A

Mix No. : 13657
 No. of Specimens : 3
 Project : MACTAQUAC GS
 Date Cast : 03-Jul-85
 Age (as of Jan 1/90) : 4 years
 Remarks : Specimens stored at 38 C

Fine Aggregate: S-7492 N.B. SAND
 Coarse Aggregate: S-7487 N.B. CR RK
 Cement: CL70138 PROJECT

TEST DATA

Date	Age (Months)	Avg Exp (%)	Date	Age (Months)	Avg Exp (%)
04-Jul-85	0.0	0.000	28-Apr-87	22	0.038
17-Jul-85	0.5	-0.004	23-Jun-87	24	0.044
31-Jul-85	1	-0.001	25-Feb-88	32	0.053
28-Aug-85	2	-0.001	27-Apr-88	34	0.056
25-Sep-85	3	0.000	05-Jul-88	36	0.061
23-Oct-85	4	0.001	04-Oct-88	39	0.066
20-Nov-85	5	0.003	04-Jan-89	42	0.070
18-Dec-85	6	0.002	04-Apr-89	45	0.075
11-Mar-86	8	0.005	04-Jul-89	48	0.080
08-Apr-86	9	0.011	04-Oct-89	51	0.085
07-May-86	10	0.012	04-Jan-90	54	0.086
03-Jun-86	11	0.013			
03-Jul-86	12	0.014			
28-Aug-86	14	0.022			
28-Oct-86	16	0.026			
30-Dec-86	18	0.032			
27-Feb-87	20	0.035			



APPENDIX D

**LENGTH AND WEIGHT CHANGE OF HARDENED
HYDRAULIC-CEMENT MORTAR AND CONCRETE
ASTM C 157
LONG-TERM TEST DATA**

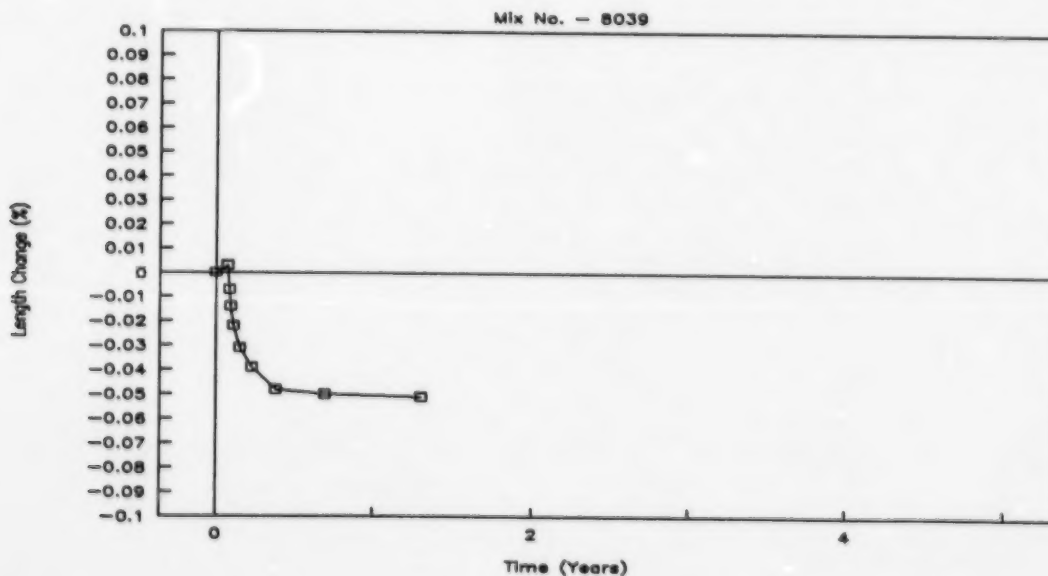
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	8039	Fine Aggregate:	6451 SPECULARITE
No. of Specimens :	3	Coarse Aggregate:	6542 MAGNETITE
Project :	HIGH DENSITY CONCRETE	Cement:	ST. MARY'S BOWMANVILLE (CL70281)
Date Cast :	19-Jul-88		
Age (as of Jan 1/90) :	2 years		
Remarks :	Specimens were cast at Darlington GS		
	Specimens stored at 23 C and 50% rh		
	Lime water cured for 28 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
20-Jul-88	0.0	0.000			
15-Aug-88	1	0.003			
19-Aug-88	1	-0.007			
22-Aug-88	1	-0.014			
29-Aug-88	1	-0.022			
12-Sep-88	2	-0.031			
11-Oct-88	3	-0.039			
05-Dec-88	5	-0.048			
29-Mar-89	8	-0.050			
06-Nov-89	16	-0.051			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

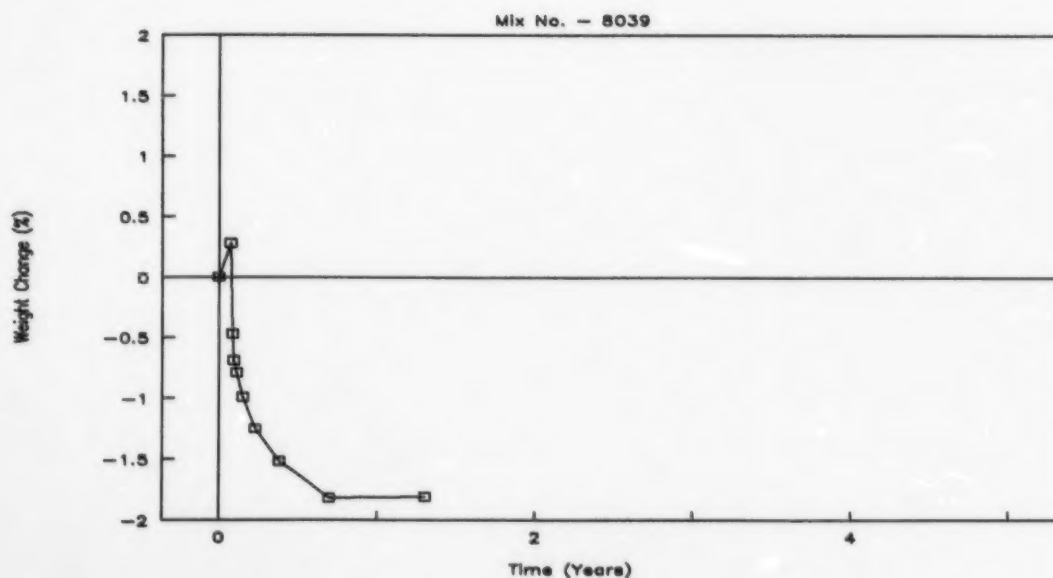
Mix No. : 8039
 No. of Specimens : 3
 Project : HIGH DENSITY CONCRETE
 Date Cast : 19-Jul-88
 Age (as of Jan 1/90) : 2 years

Fine Aggregate: 6541 SPECULARITE
 Coarse Aggregate: 6542 MAGNETITE
 Cement: ST. MARY'S BOWMANVILLE
 (CL70281)

Remarks : Specimens were cast at Darlington GS
 Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
20-Jul-88	0.0	0.000			
15-Aug-88	1	0.280			
19-Aug-88	1	-0.470			
22-Aug-88	1	-0.690			
29-Aug-88	1	-0.790			
12-Sep-88	2	-0.990			
11-Oct-88	3	-1.250			
05-Dec-88	5	-1.520			
29-Mar-89	8	-1.820			
06-Nov-89	16	-1.810			



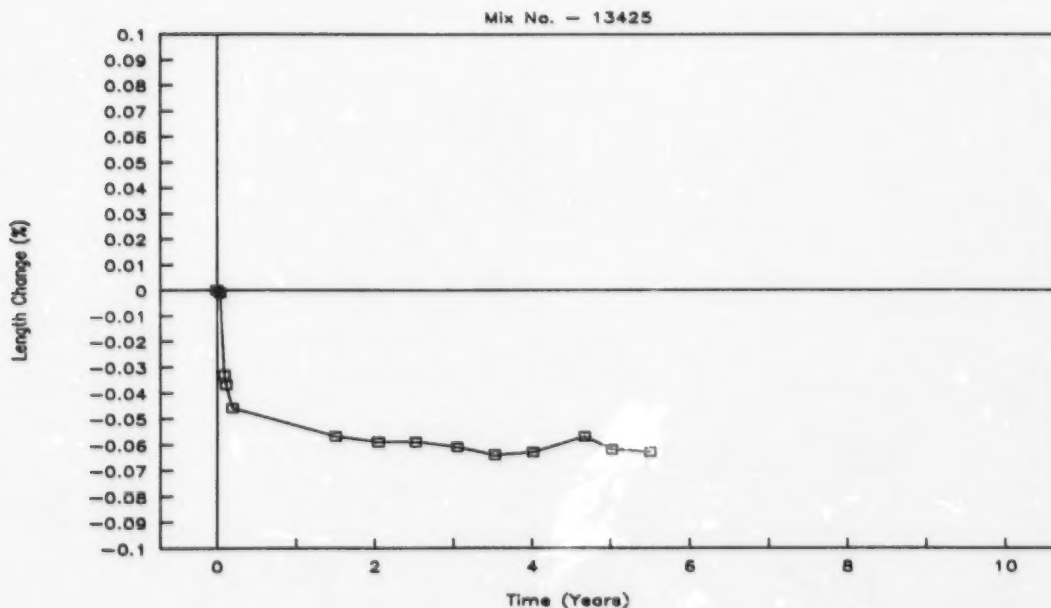
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13425	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	29-Nov-83	Superplasticizer:	CONTROL
Age (as of Jan 1/90) :	6 years		
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured in lime water for 14 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
30-Nov-83	0.0	0.000			
13-Dec-83	0	-0.001			
03-Jan-84	1	-0.033			
10-Jan-84	1	-0.037			
07-Feb-84	2	-0.046			
30-May-85	18	-0.057			
13-Dec-85	24	-0.059			
04-Jun-86	30	-0.059			
15-Dec-86	37	-0.061			
08-Jun-87	42	-0.064			
02-Dec-87	48	-0.063			
29-Jul-88	56	-0.057			
02-Dec-88	60	-0.062			
29-May-89	66	-0.063			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

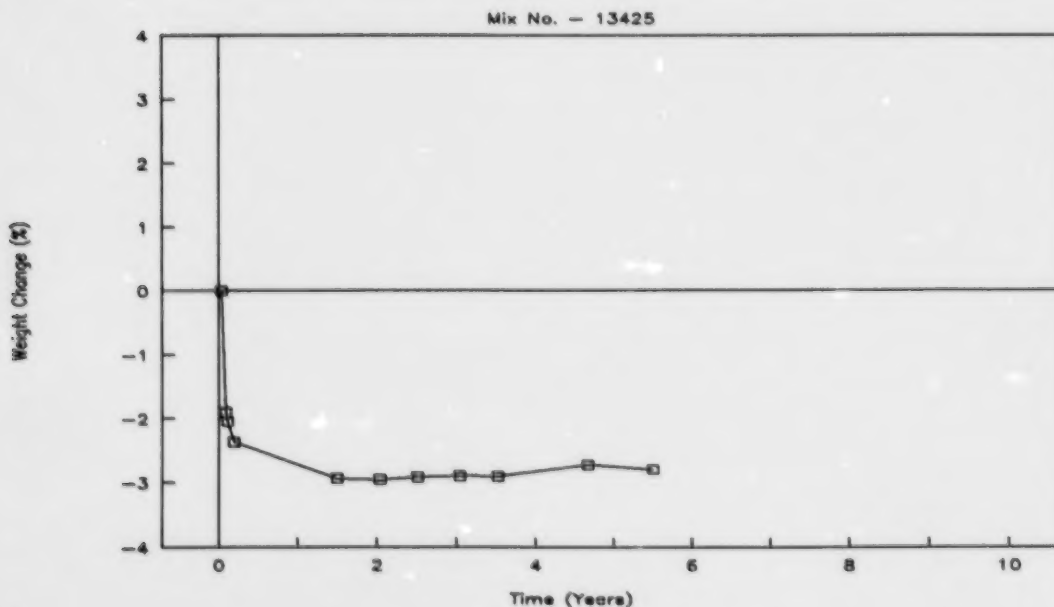
ASTM C 157

Mix No. : 13425
 No. of Specimens : 3
 Project : DARLINGTON GS
 Date Cast : 29-Nov-83
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured in lime water for 14 days

Fine Aggregate: S-7436 FLEETWOOD SAND
 Coarse Aggregate: S-7437 FLEETWOOD CR GR
 Cement: CL70017 ST MARY'S TYPE 40
 Superplasticizer: CONTROL

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
30-Nov-83	0.0	—			
13-Dec-83	0	0.000			
03-Jan-84	1	-1.906			
10-Jan-84	1	-2.054			
07-Feb-84	2	-2.368			
30-May-85	18	-2.937			
13-Dec-85	24	-2.955			
04-Jun-86	30	-2.918			
15-Dec-86	37	-2.898			
08-Jun-87	42	-2.909			
29-Jul-88	56	-2.731			
29-May-89	66	-2.800			



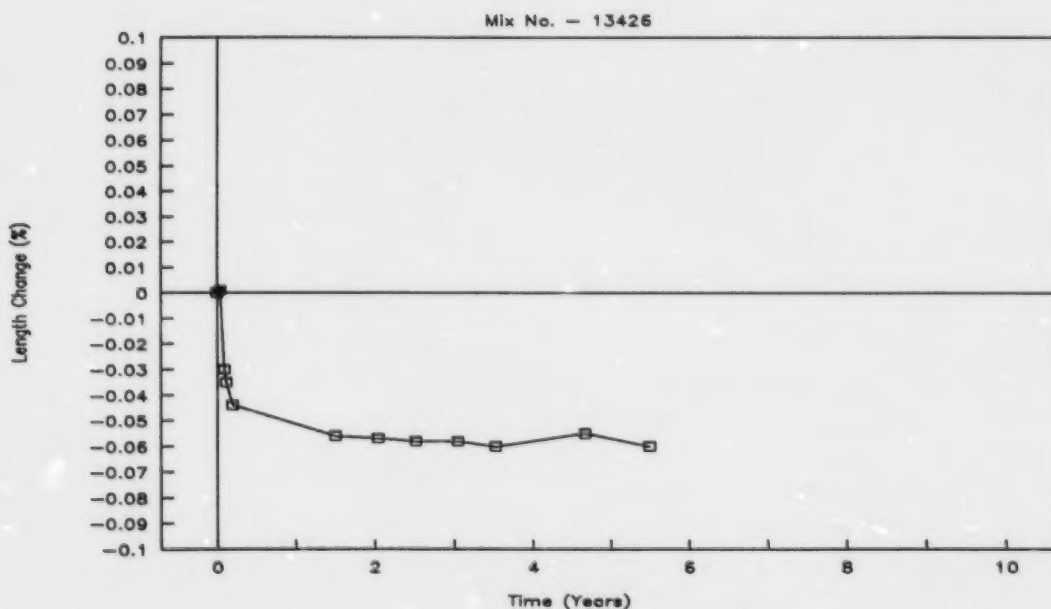
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13426	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	30-Nov-83	Superplasticizer:	MIGHTY 150
Age (as of Jan 1/90) :	6 years		
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured in lime water for 14 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
01-Dec-83	0.0	0.000			
14-Dec-83	0	0.001			
04-Jan-84	1	-0.030			
11-Jan-84	1	-0.035			
08-Feb-84	2	-0.044			
30-May-85	18	-0.056			
13-Dec-85	24	-0.057			
04-Jun-86	30	-0.058			
15-Dec-86	37	-0.058			
08-Jun-87	42	-0.060			
29-Jul-88	56	-0.055			
28-May-89	66	-0.060			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

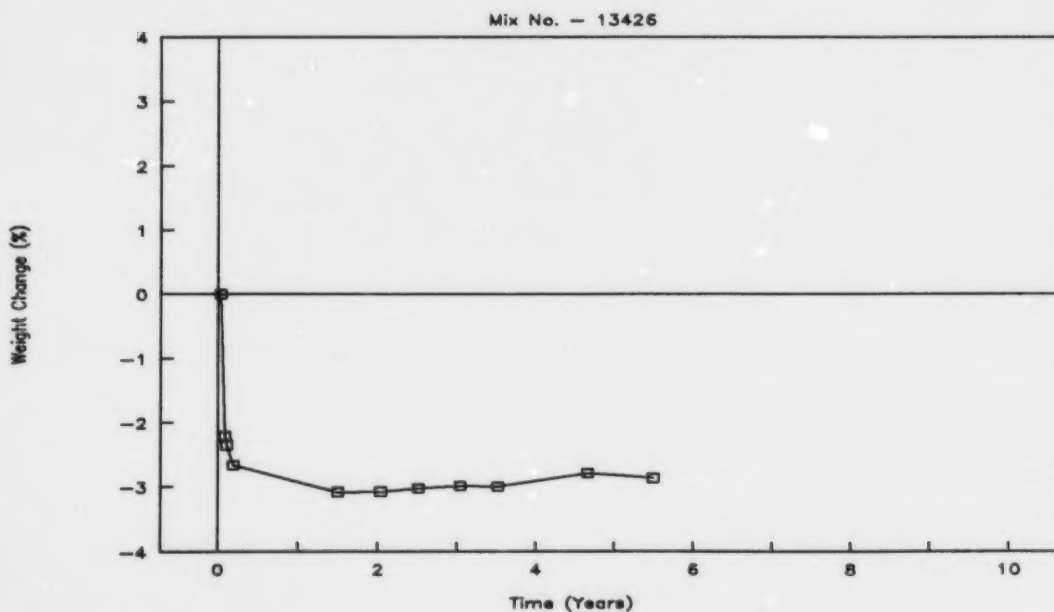
ASTM C 157

Mix No. : 13426
 No. of Specimens : 3
 Project : DARLINGTON GS
 Date Cast : 30-Nov-83
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured in lime water for 14 days

Fine Aggregate: S-7436 FLEETWOOD SAND
 Coarse Aggregate: S-7437 FLEETWOOD CR GR
 Cement: CL70017 ST MARY'S TYPE 40
 Superplasticizer: MIGHTY 150

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
01-Dec-83	0.0	—			
14-Dec-83	0	0.000			
04-Jan-84	1	-2.203			
11-Jan-84	1	-2.351			
08-Feb-84	2	-2.664			
30-May-85	18	-3.084			
13-Dec-85	24	-3.073			
04-Jun-86	30	-3.022			
15-Dec-86	37	-2.986			
08-Jun-87	42	-2.995			
29-Jul-88	56	-2.790			
28-May-89	66	-2.865			



LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

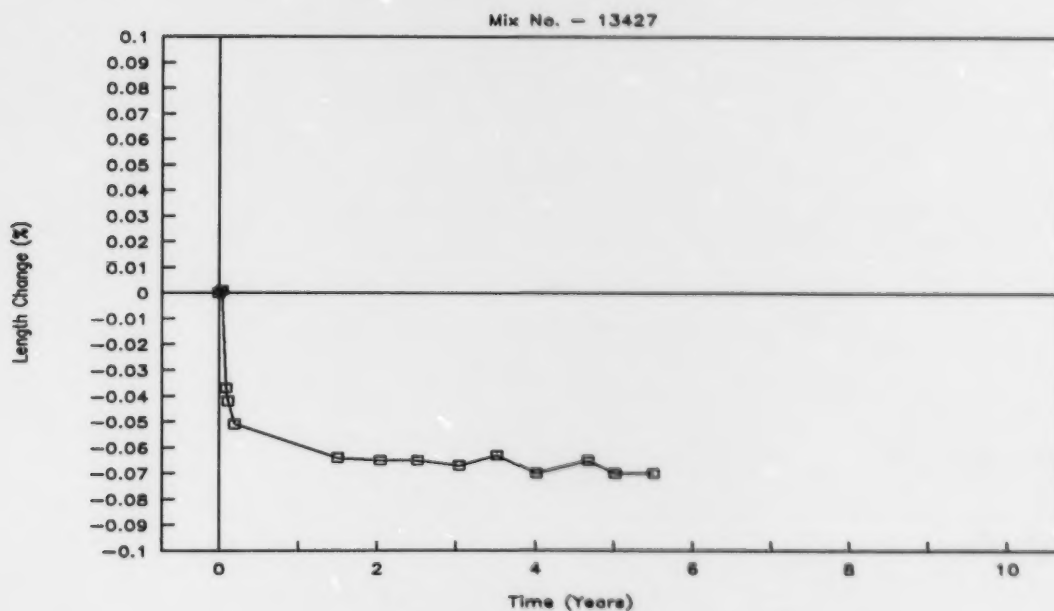
ASTM C 157

Mix No. : 13427
 No. of Specimens : 3
 Project : DARLINGTON GS
 Date Cast : 30-Nov-83
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured in lime water for 14 days

Fine Aggregate: S-7436 FLEETWOOD SAND
 Coarse Aggregate: S-7437 FLEETWOOD CR GR
 Cement: CL70017 ST MARY'S TYPE 40
 Superplasticizer: DX 100

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
01-Dec-83	0.0	0.000			
14-Dec-83	0	0.001			
04-Jan-84	1	-0.037			
11-Jan-84	1	-0.042			
08-Feb-84	2	-0.051			
30-May-85	18	-0.064			
13-Dec-85	24	-0.065			
04-Jun-86	30	-0.065			
15-Dec-86	37	-0.067			
08-Jun-87	42	-0.063			
02-Dec-87	48	-0.070			
29-Jul-88	56	-0.065			
02-Dec-88	60	-0.070			
29-May-89	66	-0.070			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

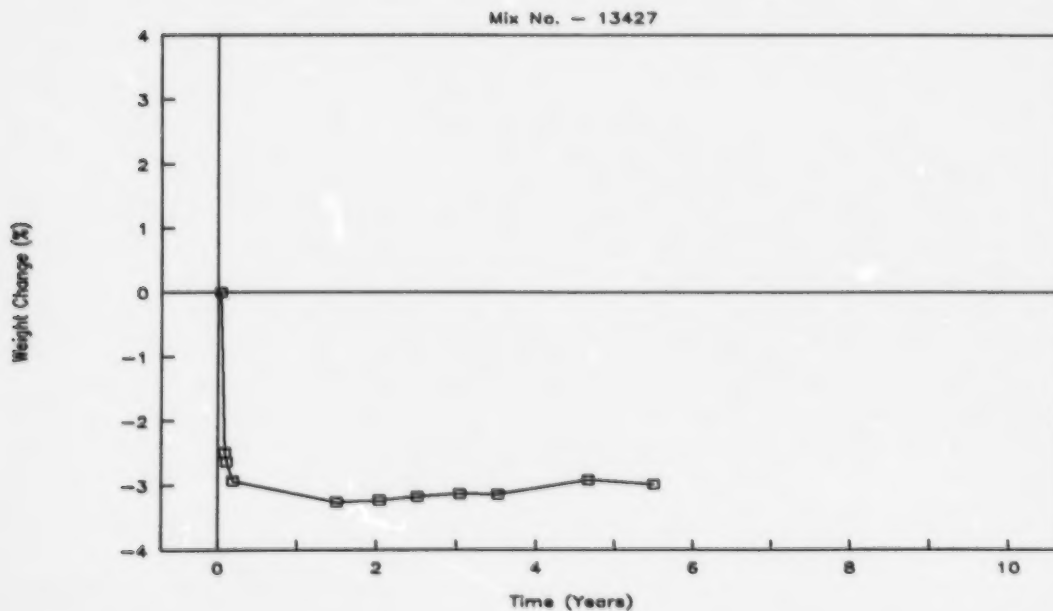
ASTM C 157

Mix No. : 13427
 No. of Specimens : 3
 Project : DARLINGTON GS
 Date Cast : 30-Nov-83
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured in lime water for 14 days

Fine Aggregate: S-7436 FLEETWOOD SAND
 Coarse Aggregate: S-7437 FLEETWOOD CR GR
 Cement: CL70017 ST MARY'S TYPE 40
 Superplasticizer: DX 100

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
01-Dec-83	0.0	—			
14-Dec-83	0	0.000			
04-Jan-84	1	-2.488			
11-Jan-84	1	-2.632			
08-Feb-84	2	-2.928			
30-May-85	18	-3.261			
13-Dec-85	24	-3.236			
04-Jun-86	30	-3.180			
15-Dec-86	37	-3.137			
08-Jun-87	42	-3.144			
29-Jul-88	56	-2.919			
29-May-89	66	-2.988			



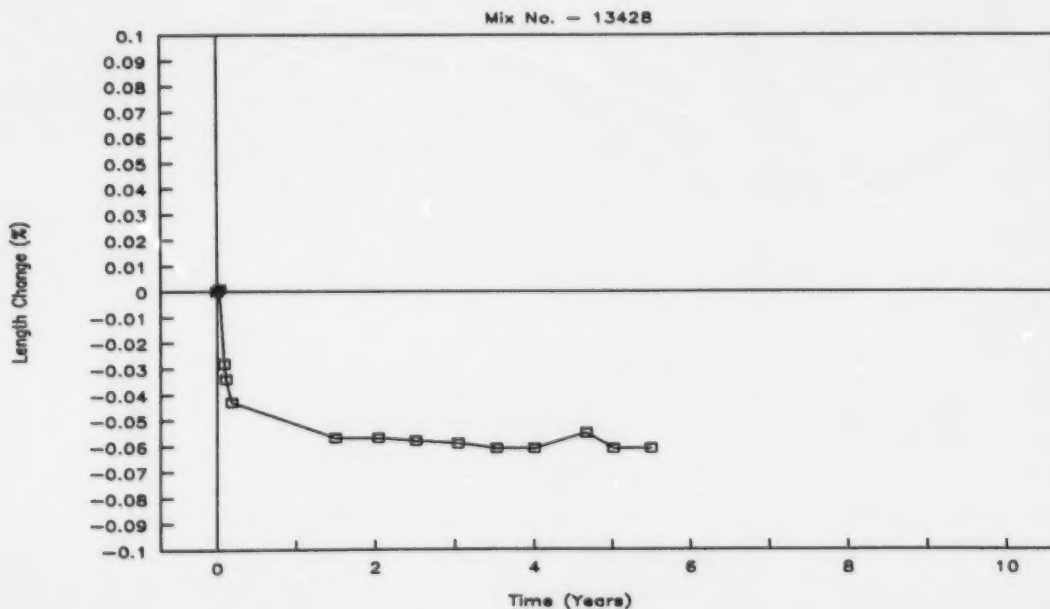
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13428	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	01-Dec-83	Superplasticizer:	SIKAMENT
Age (as of Jan 1/90) :	6 years		PLASTIMENT
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured in lime water for 14 days		

TEST DATA

Dat	Age	Avg Len	Date	Age	Avg Len
	(Months)	(%)		(Months)	(%)
02-Dec-83	0.0	0.000			
14-Dec-83	0	0.001			
04-Jan-84	1	-0.028			
11-Jan-84	1	-0.034			
08-Feb-84	2	-0.043			
30-May-85	18	-0.057			
13-Dec-85	24	-0.057			
04-Jun-86	30	-0.058			
15-Dec-86	36	-0.059			
08-Jun-87	42	-0.061			
02-Dec-87	48	-0.061			
29-Jul-88	56	-0.055			
02-Dec-88	60	-0.061			
29-May-89	66	-0.061			



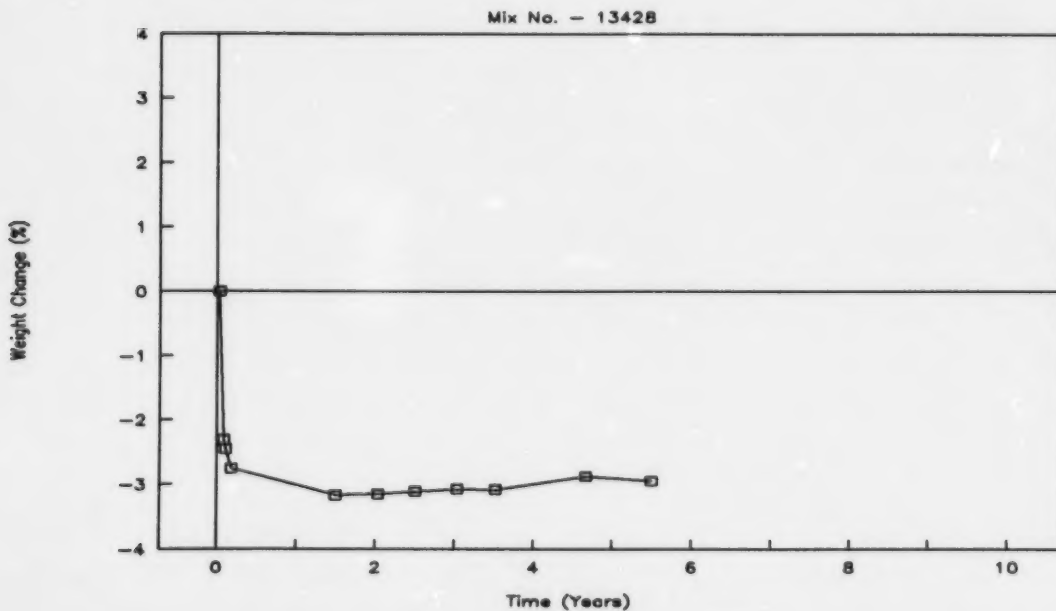
WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13428	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	01-Dec-83	Superplasticizer:	SIKAMENT
Age (as of Jan 1/90) :	6 years		PLASTIMENT
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured in lime water for 14 days		

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
02-Dec-83	0.0	—			
14-Dec-83	0	0.000			
04-Jan-84	1	-2.308			
11-Jan-84	1	-2.453			
08-Feb-84	2	-2.758			
30-May-85	18	-3.168			
13-Dec-85	24	-3.154			
04-Jun-86	30	-3.107			
15-Dec-86	36	-3.074			
08-Jun-87	42	-3.081			
29-Jul-88	56	-2.879			
29-May-89	66	-2.950			



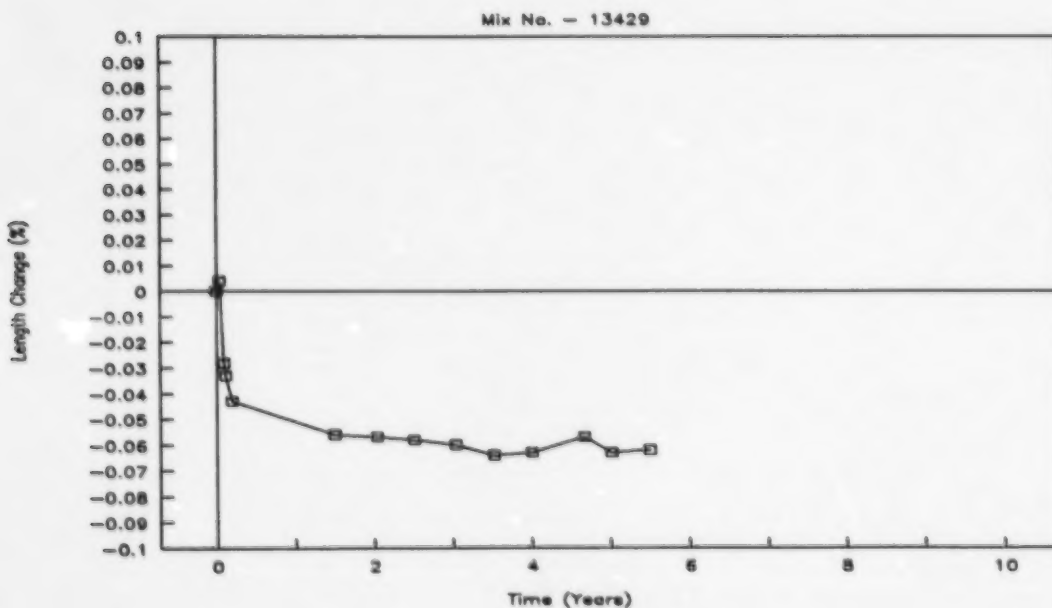
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13429	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	01-Dec-83	Superplasticizer:	MELMENT
Age (as of Jan 1/90) :	6 years		
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured in lime water for 14 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
02-Dec-83	0.0	0.000			
15-Dec-83	0	0.004			
05-Jan-84	1	-0.028			
12-Jan-84	1	-0.033			
09-Feb-84	2	-0.043			
30-May-85	18	-0.056			
13-Dec-85	24	-0.057			
04-Jun-86	30	-0.058			
15-Dec-86	36	-0.060			
08-Jun-87	42	-0.064			
02-Dec-87	48	-0.063			
29-Jul-88	56	-0.057			
02-Dec-88	60	-0.063			
29-May-89	66	-0.062			



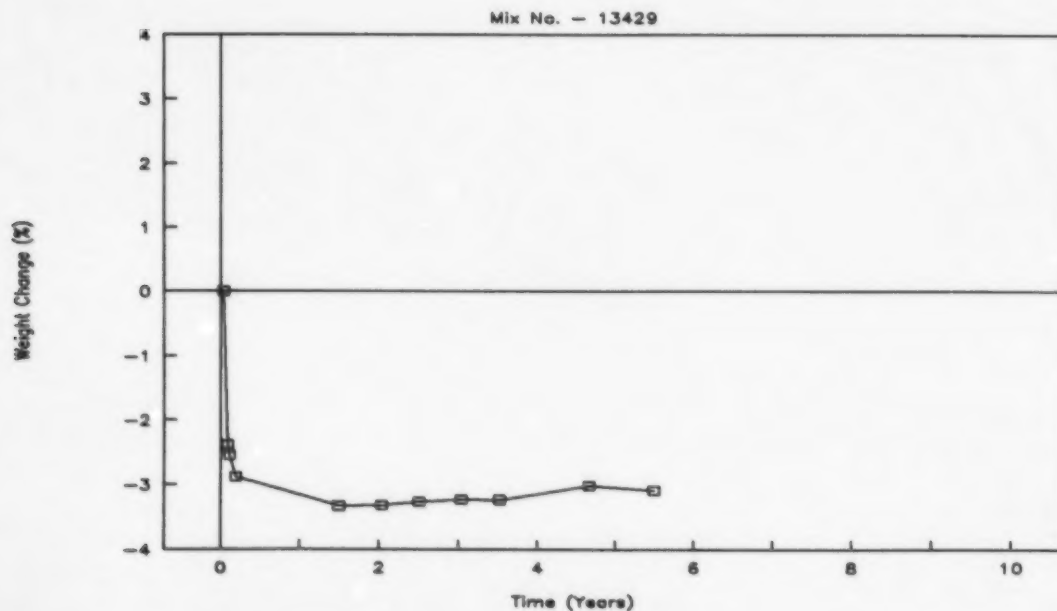
WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13429	Fine Aggregate:	S-7436 FLEETWOOD SAND
No. of Specimens :	3	Coarse Aggregate:	S-7437 FLEETWOOD CR GR
Project :	DARLINGTON GS	Cement:	CL70017 ST MARY'S TYPE 40
Date Cast :	01-Dec-83	Superplasticizer:	MELMENT
Age (as of Jan 1/90) :	6 years		
Remarks :	Specimens stored at 23 C and 50% rh Moist cured in lime water for 14 days		

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
02-Dec-83	0.0	—			
15-Dec-83	0	0.000			
05-Jan-84	1	-2.388			
12-Jan-84	1	-2.548			
09-Feb-84	2	-2.877			
30-May-85	18	-3.331			
13-Dec-85	24	-3.318			
04-Jun-86	30	-3.266			
15-Dec-86	36	-3.229			
08-Jun-87	42	-3.235			
29-Jul-88	56	-3.013			
29-May-89	66	-3.086			



LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

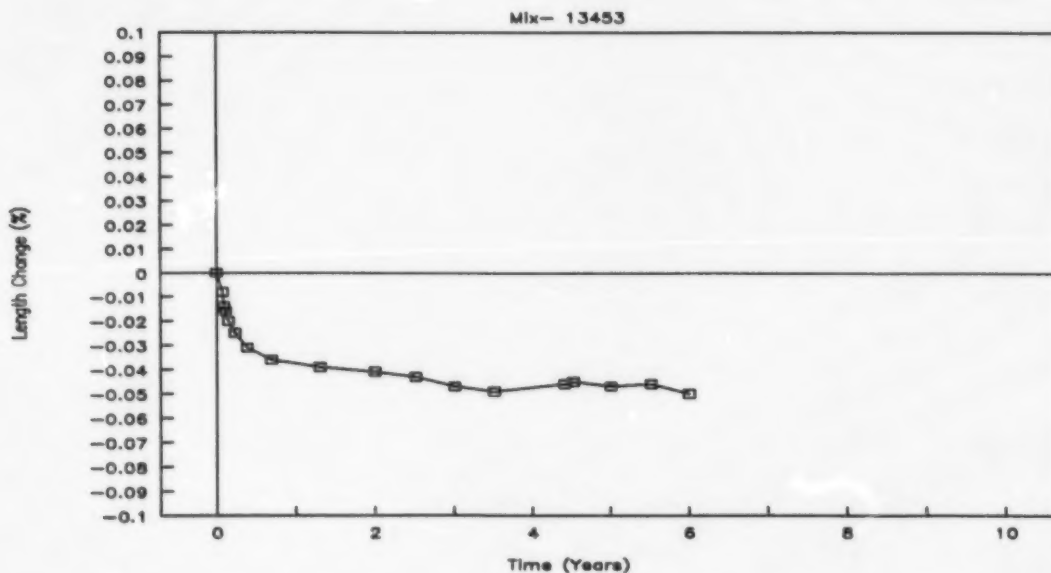
ASTM C 157

Mix No. : 13453
 No. of Specimens : 3
 Project : HIGH DENSITY CONCRETE
 Date Cast : 29-Feb-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

Fine Aggregate: S-7449 SPECULARITE
 Coarse Aggregate: S-7450 MAGNETITE
 Cement: CL70037 TYPE 50
 Silica Fume: 20% CL69888

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
01-Mar-84	0.0	0.000	05-Sep-89	66	-0.046
23-Mar-84	1	-0.008	01-Mar-90	72	-0.050
04-Apr-84	1	-0.014			
11-Apr-84	1	-0.016			
25-Apr-84	2	-0.020			
23-May-84	3	-0.025			
18-Jul-84	5	-0.031			
07-Nov-84	8	-0.036			
19-Jun-85	16	-0.039			
28-Feb-86	24	-0.041			
04-Sep-86	30	-0.043			
04-Mar-87	36	-0.047			
04-Sep-87	42	-0.049			
29-Jul-88	53	-0.046			
08-Sep-88	54	-0.045			
01-Mar-89	60	-0.047			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

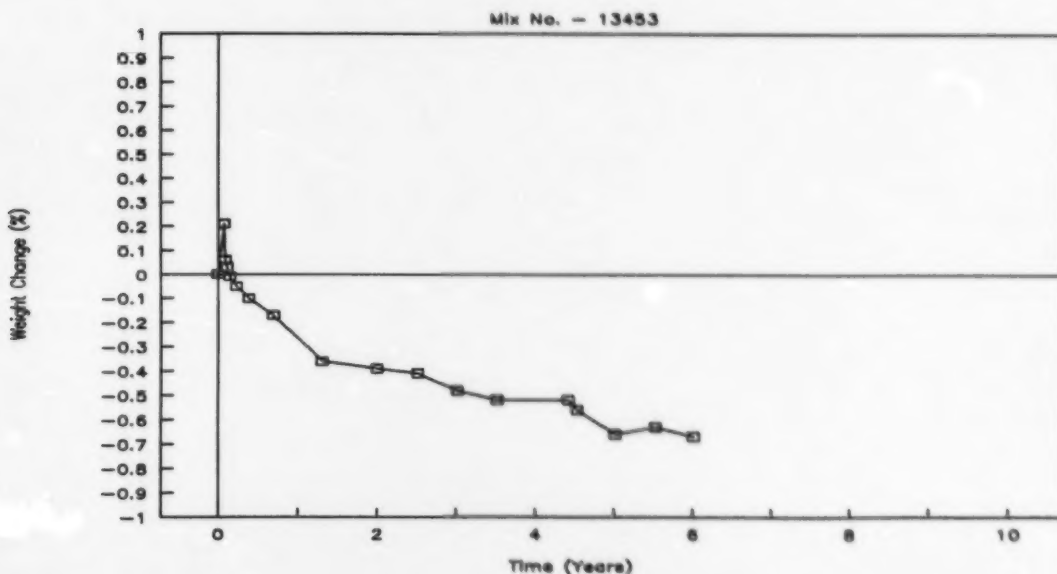
ASTM C 157

Mix No. : 13453
 No. of Specimens : 3
 Project : HIGH DENSITY CONCRETE
 Date Cast : 29-Feb-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

Fine Aggregate: S-7449 SPECULARITE
 Coarse Aggregate: S-7450 MAGNETITE
 Cement: CL70037 TYPE 50
 Silica Fume: 20% CL69888

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
01-Mar-84	0.0	0.000	05-Sep-89	66	-0.630
28-Mar-84	1	0.210	01-Mar-90	72	-0.670
04-Apr-84	1	0.060			
11-Apr-84	1	0.030			
25-Apr-84	2	-0.010			
23-May-84	3	-0.050			
18-Jul-84	5	-0.100			
07-Nov-84	8	-0.170			
19-Jun-85	16	-0.360			
28-Feb-86	24	-0.390			
04-Sep-86	30	-0.410			
04-Mar-87	36	-0.480			
04-Sep-87	42	-0.520			
29-Jul-88	53	-0.520			
08-Sep-88	54	-0.560			
01-Mar-89	60	-0.660			



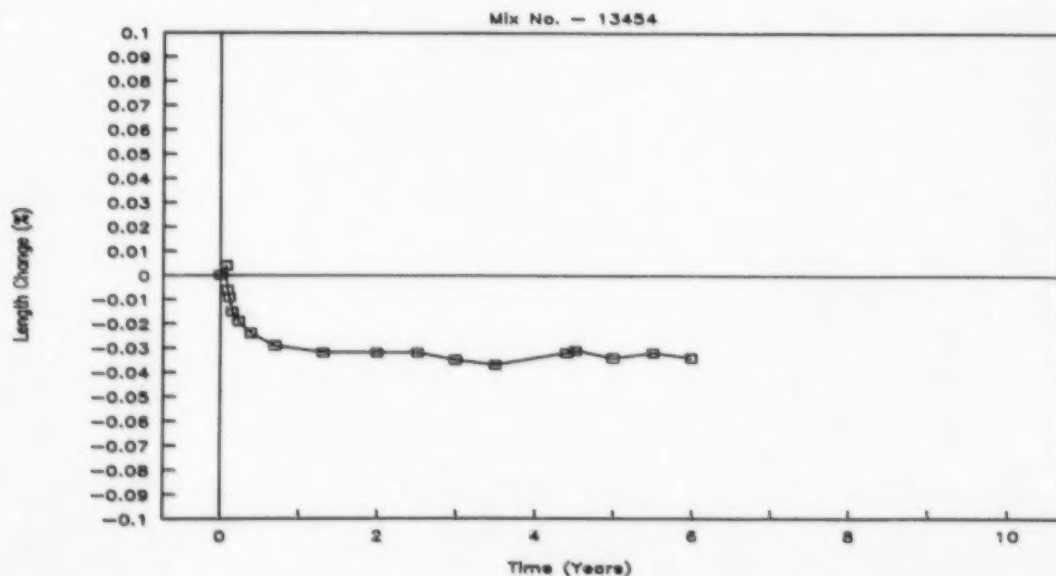
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. : 13454
 No. of Specimens : 3
 Project : HIGH DENSITY CONCRETE
 Date Cast : 07-Mar-84
 Age (as of Jan 1/90) : 6 years
 Fine Aggregate: S-7449 SPECULARITE
 Coarse Aggregate: S-7450 MAGNETITE
 Cement: CL69944 TYPE 40
 Remarks : Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
08-Mar-84	0.0	0.000	01-Mar-90	72	-0.034
04-Apr-84	1	0.004			
11-Apr-84	1	-0.006			
18-Apr-84	1	-0.009			
02-May-84	2	-0.015			
30-May-84	3	-0.019			
26-Jul-84	5	-0.024			
14-Nov-84	8	-0.029			
26-Jun-85	16	-0.032			
04-Mar-86	24	-0.032			
09-Sep-86	30	-0.032			
04-Mar-87	36	-0.035			
04-Sep-87	42	-0.037			
29-Jul-88	53	-0.032			
08-Sep-88	54	-0.031			
01-Mar-89	60	-0.034			
05-Sep-89	66	-0.032			



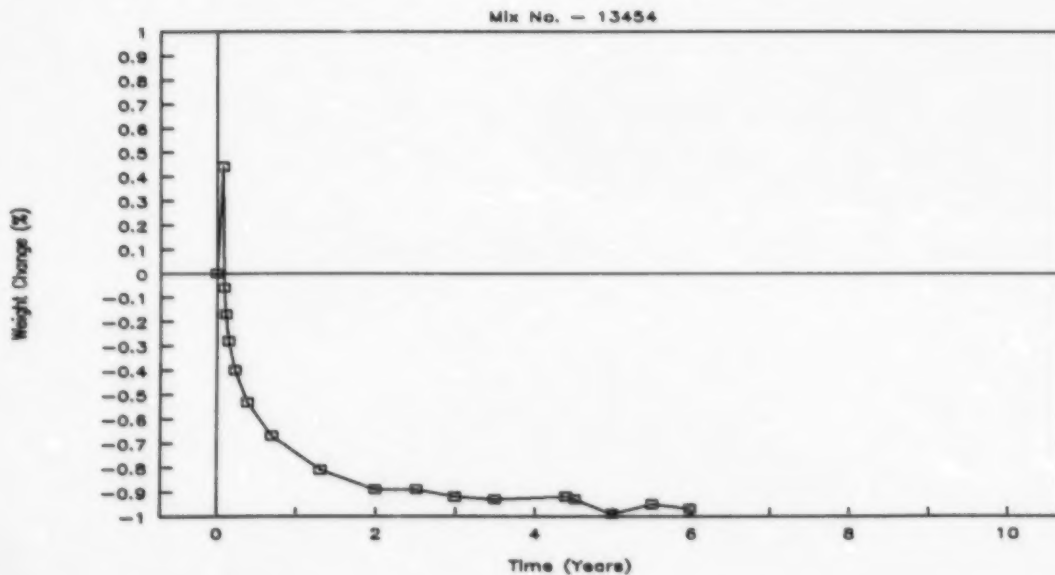
WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. : 13454 Fine Aggregate: S-7449 SPECULARITE
 No. of Specimens : 3 Coarse Aggregate: S-7450 MAGNETITE
 Project : HIGH DENSITY CONCRETE Cement: CL69944 TYPE 40
 Date Cast : 07-Mar-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
08-Mar-84	0.0	0.000	01-Mar-90	72	-0.970
04-Apr-84	1	0.440			
11-Apr-84	1	-0.060			
18-Apr-84	1	-0.170			
02-May-84	2	-0.280			
30-May-84	3	-0.400			
26-Jul-84	5	-0.530			
14-Nov-84	8	-0.670			
26-Jun-85	16	-0.810			
04-Mar-86	24	-0.890			
09-Sep-86	30	-0.890			
04-Mar-87	36	-0.920			
04-Sep-87	42	-0.930			
29-Jul-88	53	-0.920			
08-Sep-88	54	-0.930			
01-Mar-89	60	-0.990			
05-Sep-89	66	-0.950			



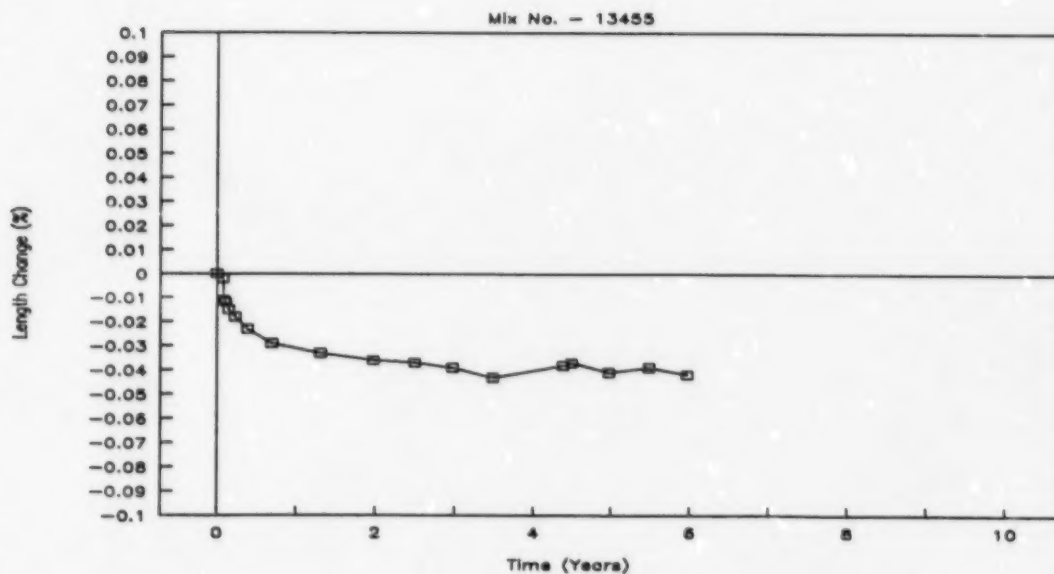
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13455	Fine Aggregate: S-7449 SPECULARITE
No. of Specimens :	3	Coarse Aggregate: S-7450 MAGNETITE
Project :	HIGH DENSITY CONCRETE	Cement: CL70037 TYPE 50
Date Cast :	13-Mar-84	Silica Fume: 10% CL69888
Age (as of Jan 1/90) :	6 years	
Remarks :	Specimens stored at 23 C and 50% rh	
	Lime water cured for 28 days	

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
14-Mar-84	0.0	0.000	01-Mar-90	72	-0.042
10-Apr-84	1	-0.002			
17-Apr-84	1	-0.011			
24-Apr-84	1	-0.012			
08-May-84	2	-0.015			
05-Jun-84	3	-0.018			
31-Jul-84	5	-0.023			
20-Nov-84	8	-0.029			
02-Jul-85	16	-0.033			
04-Mar-86	24	-0.036			
09-Sep-86	30	-0.037			
04-Mar-87	36	-0.039			
04-Sep-87	42	-0.043			
29-Jul-88	53	-0.038			
08-Sep-88	54	-0.037			
01-Mar-89	60	-0.041			
05-Sep-89	66	-0.039			



WEIGHT CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

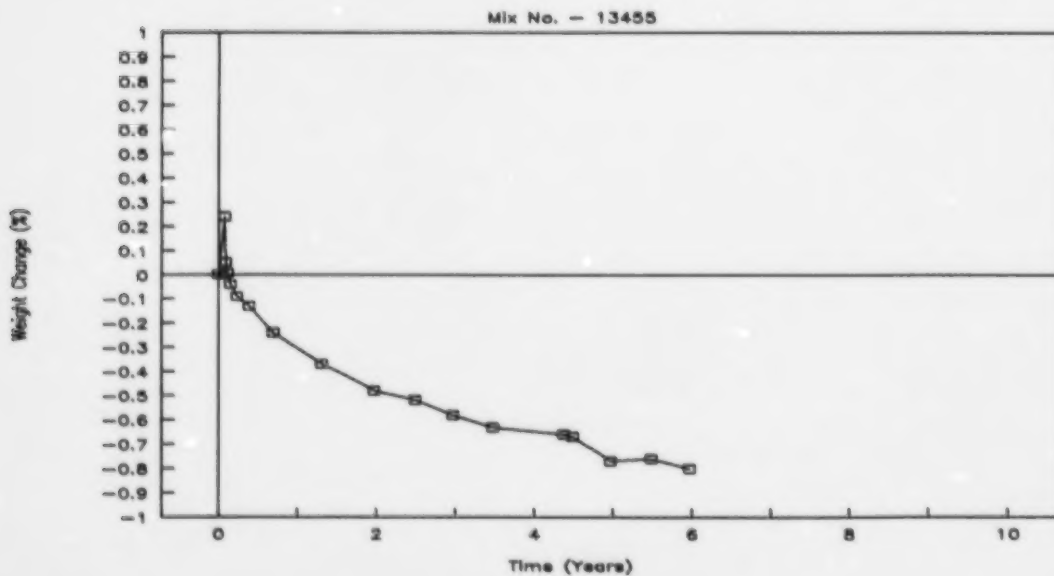
ASTM C 157

Mix No. : 13455
 No. of Specimens : 3
 Project : HIGH DENSITY CONCRETE
 Date Cast : 13-Mar-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Lime water cured for 28 days

Fine Aggregate: S-7449 SPECULARITE
 Coarse Aggregate: S-7450 MAGNETITE
 Cement: CL70037 TYPE 50
 Silica Fume: 10% CL69888

TEST DATA

Date	Age (Months)	Avg Wght (%)	Date	Age (Months)	Avg Wght (%)
14-Mar-84	0.0	0.000	01-Mar-90	72	-0.800
10-Apr-84	1	0.240			
17-Apr-84	1	0.050			
24-Apr-84	1	0.006			
08-May-84	2	-0.040			
05-Jun-84	3	-0.090			
31-Jul-84	5	-0.130			
20-Nov-84	8	-0.240			
02-Jul-85	16	-0.370			
04-Mar-86	24	-0.480			
09-Sep-86	30	-0.520			
04-Mar-87	36	-0.580			
04-Sep-87	42	-0.630			
29-Jul-88	53	-0.660			
08-Sep-88	54	-0.670			
01-Mar-89	60	-0.770			
05-Sep-89	66	-0.760			



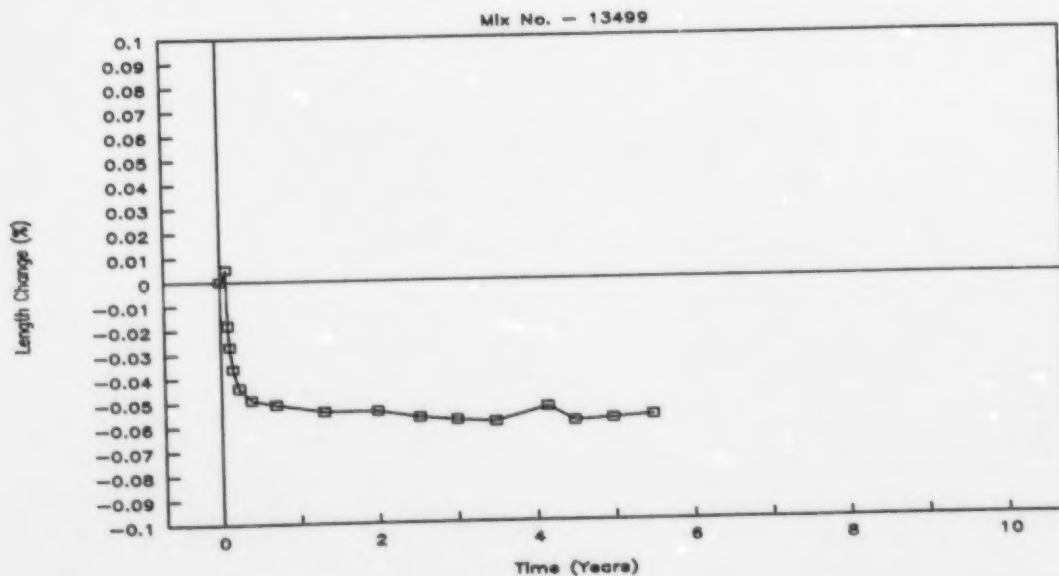
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. : 13499
 No. of Specimens : 3
 Project : PICKERING GS "A"
 Date Cast : 07-Jun-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 50% rh
 Cask mix
 Specimens cast at Darlington GS

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
08-Jun-84	0.0	0.000			
04-Jul-84	1	0.005			
11-Jul-84	1	-0.018			
18-Jul-84	1	-0.027			
01-Aug-84	2	-0.036			
29-Aug-84	3	-0.044			
24-Oct-84	5	-0.049			
15-Feb-85	8	-0.051			
25-Sep-85	16	-0.054			
04-Jun-86	24	-0.054			
17-Dec-86	30	-0.057			
08-Jun-87	36	-0.058			
04-Dec-87	42	-0.059			
29-Jul-88	50	-0.053			
02-Dec-88	54	-0.059			
29-May-89	60	-0.058			
29-Nov-89	66	-0.057			



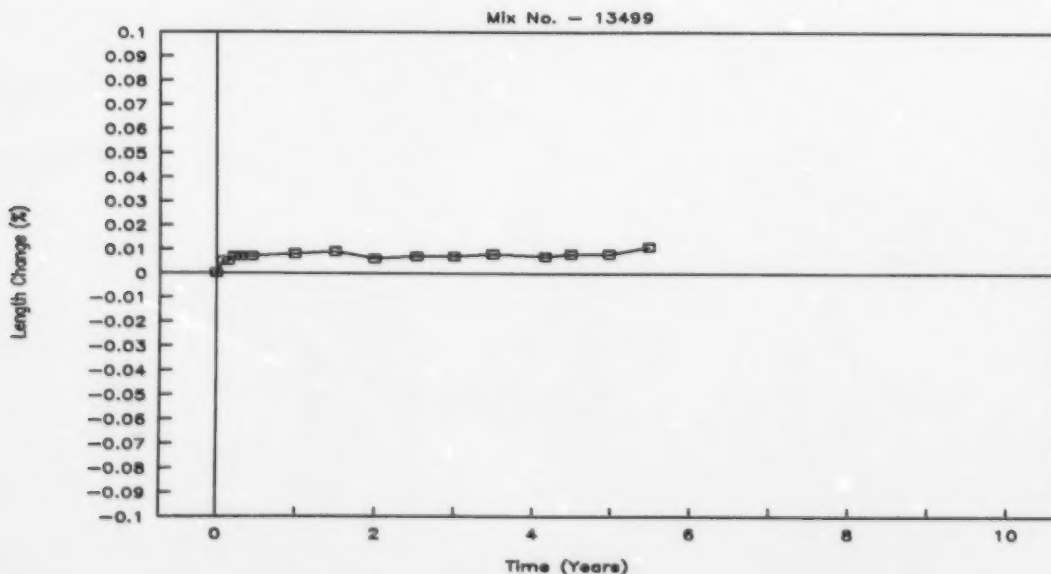
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. : 13499
 No. of Specimens : 2
 Project : PICKERING GS "A"
 Date Cast : 07-Jun-84
 Age (as of Jan 1/90) : 6 years
 Remarks : Specimens stored at 23 C and 100% rh
 Cask mix
 Specimens cast at Darlington GS

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
08-Jun-84	0.0	0.000			
04-Jul-84	1	0.005			
01-Aug-84	2	0.005			
29-Aug-84	3	0.007			
26-Sep-84	4	0.007			
21-Nov-84	5	0.007			
04-Jun-85	12	0.008			
06-Dec-85	18	0.009			
05-Jun-86	24	0.006			
17-Dec-86	30	0.007			
08-Jun-87	36	0.007			
04-Dec-87	42	0.008			
02-Aug-88	50	0.007			
02-Dec-88	54	0.008			
29-May-89	60	0.008			
29-Nov-89	66	0.011			



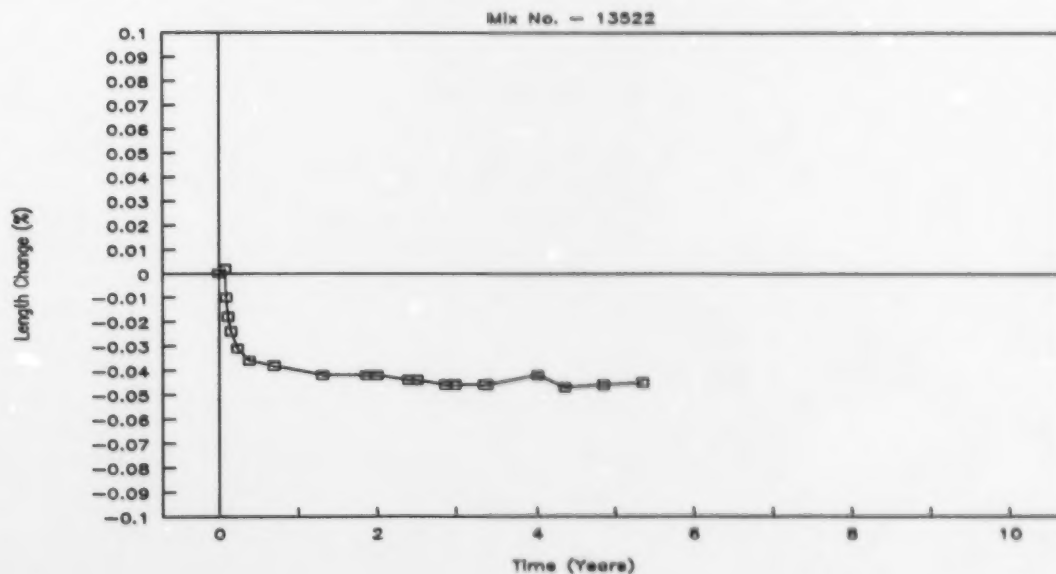
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13522	Fine Aggregate:	S-7456 SPECULARITE
No. of Specimens :	3	Coarse Aggregate:	S-7450 MAGNETITE
Project :	HIGH DENSITY CONCRETE	Cement:	CL70017 TYPE 40
Date Cast :	25-Jul-84	Fly Ash:	5% CL68358 LAB. STD.
Age (as of Jan 1/90) :	5 years		
Remarks :	Specimens stored at 23 C and 50% rh Moist cured for 28 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
26-Jul-84	0.0	0.000	29-Jul-88	48	-0.042
22-Aug-84	1	0.002	02-Dec-88	52	-0.047
29-Aug-84	1	-0.010	29-May-89	58	-0.046
05-Sep-84	1	-0.018	29-Nov-89	64	-0.045
19-Sep-84	2	-0.024			
17-Oct-84	3	-0.031			
11-Dec-84	5	-0.036			
04-Apr-85	8	-0.038			
13-Nov-85	16	-0.042			
04-Jun-86	22	-0.042			
25-Jul-86	24	-0.042			
17-Dec-86	29	-0.044			
26-Jan-87	30	-0.044			
08-Jun-87	34	-0.046			
21-Jul-87	36	-0.046			
04-Dec-87	40	-0.046			



LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

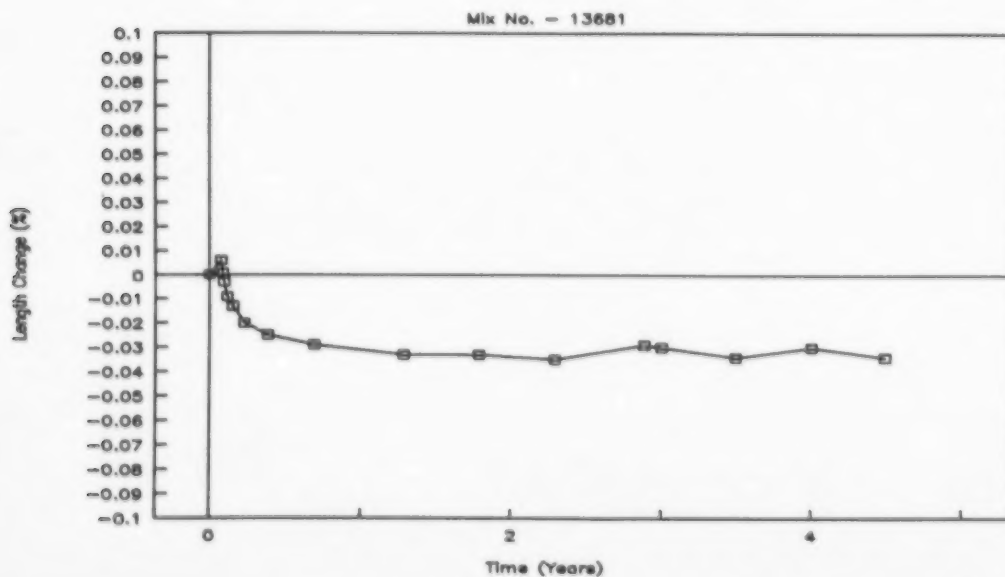
ASTM C 157

Mix No. : 13681
 No. of Specimens : 3
 Project : RAD WASTE DISPOSAL
 Date Cast : 10-Sep-85
 Age (as of Jan 1/90) : 4 years
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured for 28 days
 C-157 (3x4)

Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-6376 DUNDAS CR ST
 Cement: CL70146 TYPE 50

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
11-Sep-85	0.0	0.000			
08-Oct-85	1	0.006			
11-Oct-85	1	0.001			
15-Oct-85	1	-0.003			
22-Oct-85	1	-0.009			
05-Nov-85	2	-0.013			
03-Dec-85	3	-0.020			
28-Jan-86	5	-0.025			
20-May-86	8	-0.029			
23-Dec-86	15	-0.033			
23-Jun-87	21	-0.033			
23-Dec-87	27	-0.035			
29-Jul-88	35	-0.029			
09-Sep-88	36	-0.030			
10-Mar-89	42	-0.034			
11-Sep-89	48	-0.030			
08-Mar-90	54	-0.034			



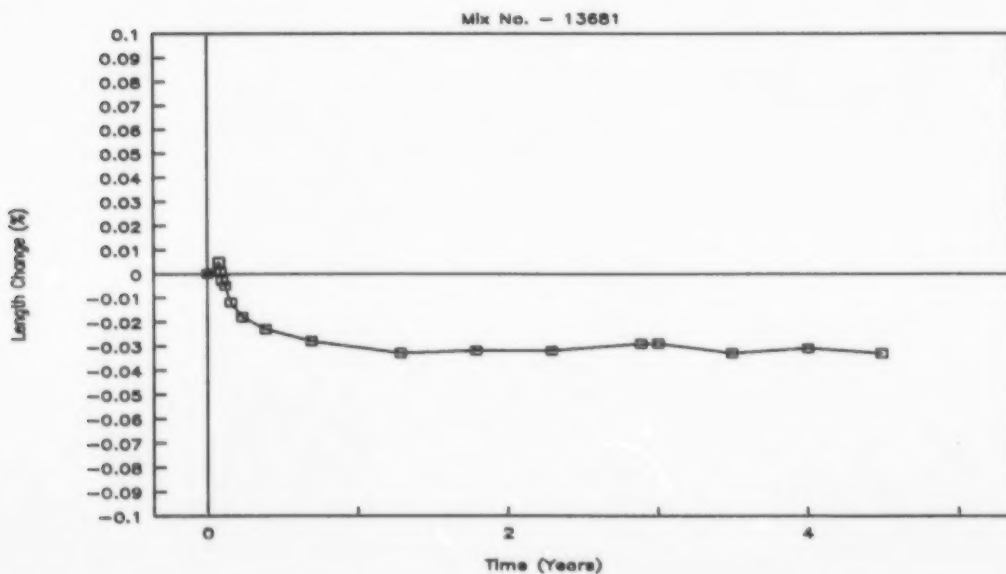
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. : 13681
 No. of Specimens : 3
 Project : RAD WASTE DISPOSAL
 Date Cast : 10-Sep-85
 Age (as of Jan 1/90) : 4 years
 Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-6376 DUNDAS CR ST
 Cement: CL70146 TYPE 50
 Remarks : Specimens stored at 23 C and 50% rh
 Moist cured for 28 days
 C-157 (3 1/2x4)

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
11-Sep-85	0.0	0.000			
08-Oct-85	1	0.005			
11-Oct-85	1	0.001			
15-Oct-85	1	-0.003			
22-Oct-85	1	-0.005			
05-Nov-85	2	-0.012			
03-Dec-85	3	-0.018			
28-Jan-86	5	-0.023			
20-May-86	8	-0.028			
23-Dec-86	15	-0.033			
23-Jun-87	21	-0.032			
23-Dec-87	27	-0.032			
29-Jul-88	35	-0.029			
09-Sep-88	36	-0.029			
10-Mar-89	42	-0.033			
11-Sep-89	48	-0.031			
08-Mar-90	54	-0.033			



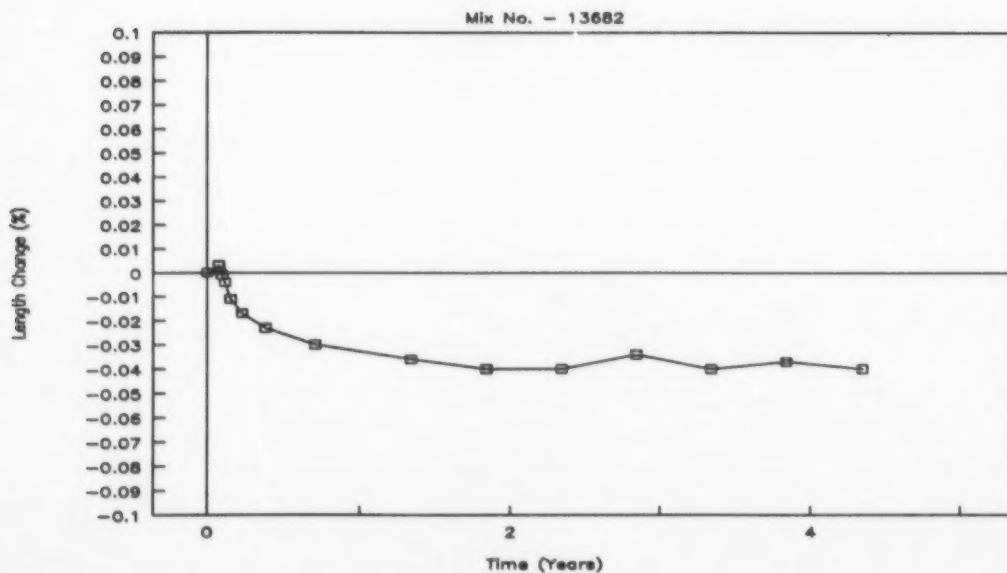
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13682	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD WASTE DISPOSAL	Cement:	CL70146 TYPE 50
Date Cast :	18-Sep-85	Silica Fume:	10% CL70109
Age (as of Jan 1/90) :	4 years		
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured for 28 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
19-Sep-85	0.0	0.000			
16-Oct-85	1	0.003			
18-Oct-85	1	0.001			
23-Oct-85	1	-0.001			
30-Oct-85	1	-0.004			
13-Nov-85	2	-0.011			
11-Dec-85	3	-0.017			
04-Feb-86	5	-0.023			
04-Jun-86	9	-0.030			
21-Jan-87	16	-0.036			
21-Jul-87	22	-0.040			
21-Jan-88	28	-0.040			
21-Jul-88	34	-0.034			
20-Jan-89	40	-0.040			
21-Jul-89	46	-0.037			
22-Jan-90	52	-0.040			



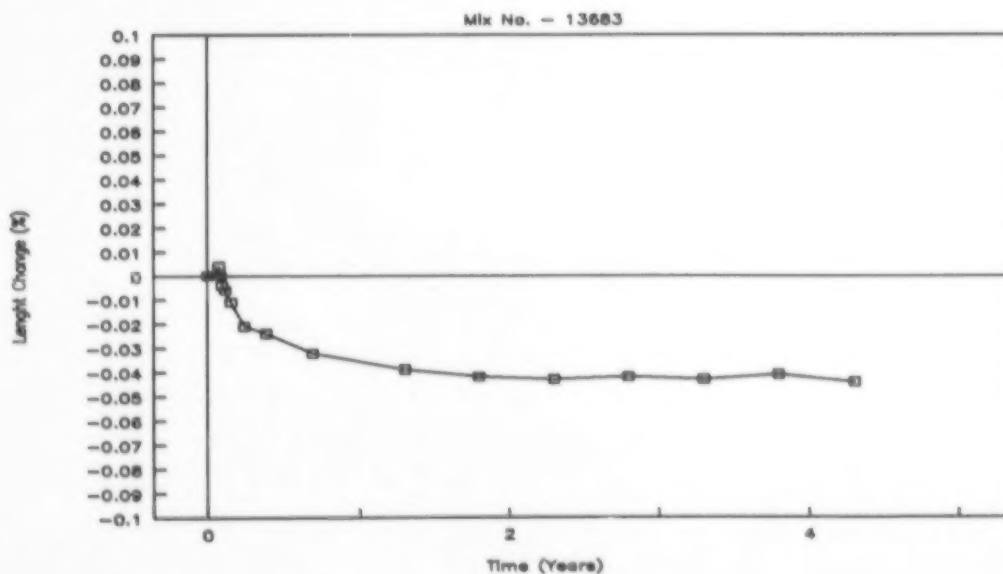
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13683	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD WASTE DISPOSAL	Cement:	CL70146 TYPE 50
Date Cast :	03-Oct-85	Silica Fume:	15% CL70109
Age (as of Jan 1/90) :	4 years		
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured for 28 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
04-Oct-85	0.0	0.000			
31-Oct-85	1	0.004			
04-Nov-85	1	0.000			
07-Nov-85	1	-0.004			
14-Nov-85	1	-0.006			
28-Nov-85	2	-0.011			
30-Dec-85	3	-0.021			
20-Feb-86	5	-0.024			
12-Jun-86	8	-0.032			
22-Jan-87	16	-0.039			
21-Jul-87	22	-0.042			
21-Jan-88	28	-0.043			
21-Jul-88	34	-0.042			
20-Jan-89	40	-0.043			
21-Jul-89	46	-0.041			
22-Jan-90	52	-0.044			



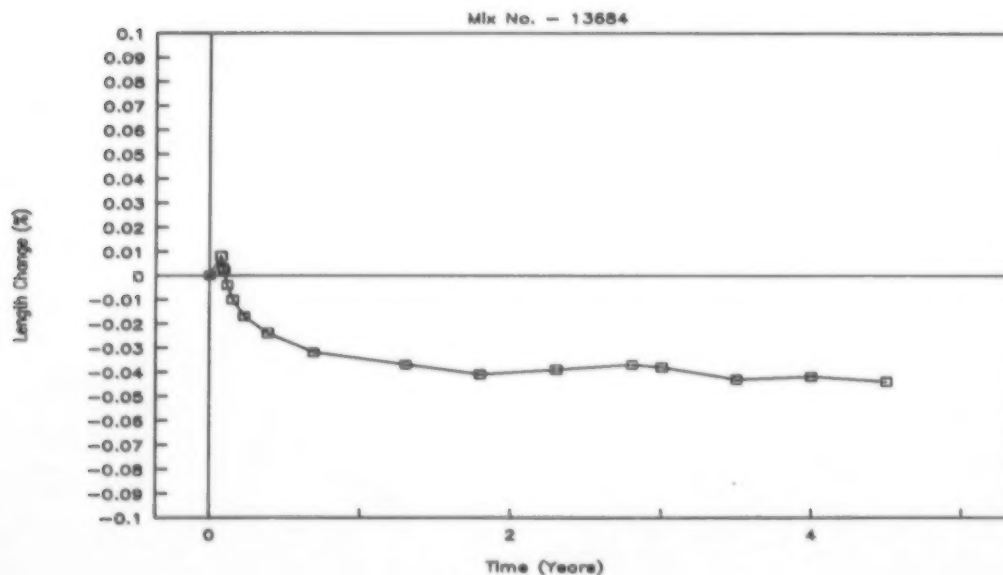
LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

ASTM C 157

Mix No. :	13684	Fine Aggregate:	S-7167 PARIS SAND
No. of Specimens :	3	Coarse Aggregate:	S-6376 DUNDAS CR ST
Project :	RAD WASTE DISPOSAL		
Date Cast :	10-Oct-85	Cement:	CL70146 TYPE 50
Age (as of Jan 1/90) :	4 years	Silica Fume:	20% CL70109
Remarks :	Specimens stored at 23 C and 50% rh		
	Moist cured for 28 days		

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
11-Oct-85	0.0	0.000	10-Apr-90	54	-0.044
07-Nov-85	1	0.008			
11-Nov-85	1	0.003			
14-Nov-85	1	0.002			
21-Nov-85	1	-0.004			
05-Dec-85	2	-0.010			
02-Jan-86	3	-0.017			
28-Feb-86	5	-0.024			
19-Jun-86	8	-0.032			
29-Jan-87	16	-0.037			
29-Jul-87	22	-0.041			
29-Jan-88	28	-0.039			
29-Jul-88	34	-0.037			
11-Oct-88	36	-0.038			
10-Apr-89	42	-0.043			
10-Oct-89	48	-0.042			



LENGTH CHANGE OF HARDENED HYDRAULIC CEMENT MORTAR AND CONCRETE

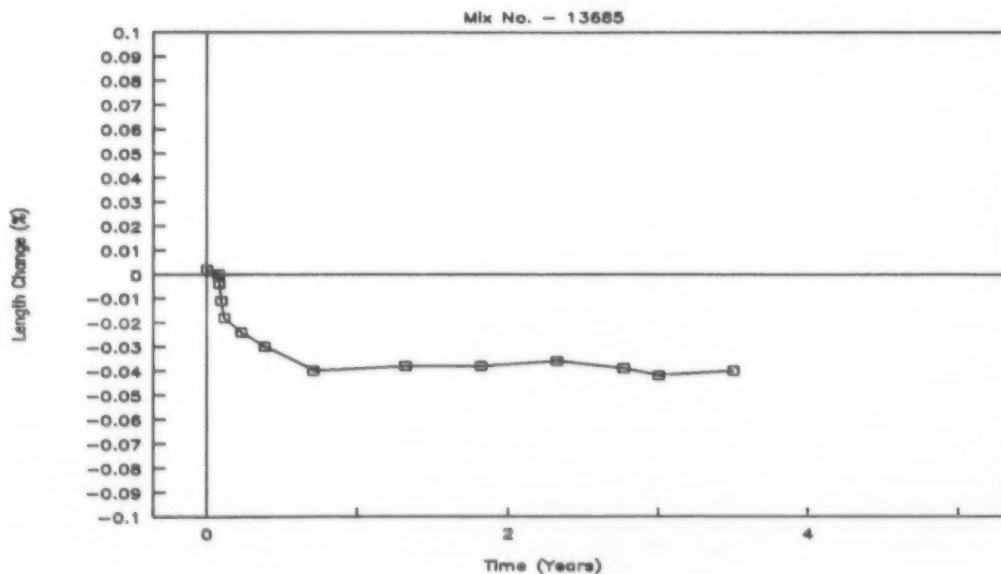
ASTM C 157

Mix No. : 13685
 No. of Specimens : 3
 Project : RAD WASTE DISPOSAL
 Date Cast : 23-Oct-85
 Age (as of Jan 1/90) : 4 years
 Remarks : Specimens stored at 23 C and 50% rh

Fine Aggregate: S-7167 PARIS SAND
 Coarse Aggregate: S-6376 DUNDAS CR ST
 Cement: CL70146 TYPE 50

TEST DATA

Date	Age (Months)	Avg Len (%)	Date	Age (Months)	Avg Len (%)
24-Oct-85	0.0	0.000			
20-Nov-85	1	0.002			
22-Nov-85	1	0.000			
27-Nov-85	1	-0.004			
04-Dec-85	1	-0.011			
15-Jan-86	3	-0.018			
12-Mar-86	5	-0.024			
09-Jul-86	9	-0.030			
17-Feb-87	16	-0.040			
18-Aug-87	22	-0.038			
18-Feb-88	28	-0.038			
29-Jul-88	33	-0.036			
24-Oct-88	36	-0.039			
24-Apr-89	42	-0.042			
24-Oct-89	48	-0.040			
23-Apr-90	54	-0.041			



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